Profits take a hit PAGE 75

Productivity rises PAGE 81

Too much debt? PAGE 89

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Electronic Business®

FOR THE MANAGEMENT TEAM IN ELECTRONICS, COMPUTER, AND SYSTEMS COMPANIES—WORLDWIDE JULY 22, 1991

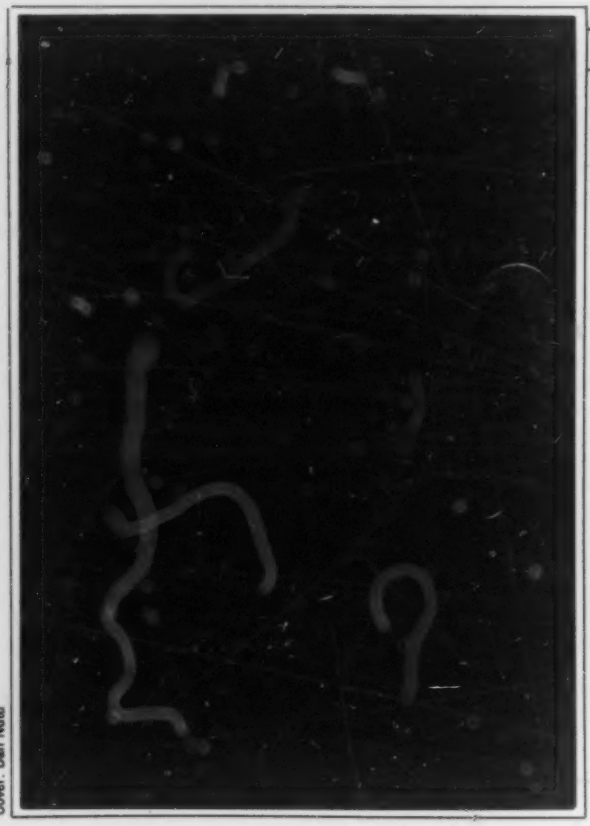
THE ELECTRONIC BUSINESS 200

THE LARGEST U.S. ELECTRONICS COMPANIES PAGE 29

Electronic Business

FOR THE MANAGEMENT TEAM IN ELECTRONICS, COMPUTER AND SYSTEMS COMPANIES WORLDWIDE

VOLUME 17, NUMBER 14 JULY 22, 1991



Cover: Dan Nutu

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32 Profits take another plunge

Despite the recession, this year's economic analysis of the 200 largest U.S. electronics companies offers good news for productivity and margins. The bad news is that profits growth for these companies deteriorated for the third year in a row, suggesting that the industry's efforts to restructure and downsize have yet to show up on the bottom line

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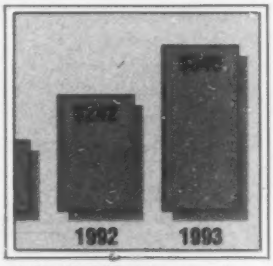

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The top 200 issue: all in a year's work

TWO hundred may seem a modest number, but it's far from modest when the 200 in question are the top 200 U.S. electronics companies. Nor is it a cakewalk for senior editors Linda Stallmann and Elizabeth Baatz to scrutinize each of those companies' annual performance for the good, bad, ugly, and just plain interesting results that reveal industry trends.

Senior editors Baatz and Stallmann unearth the top 200 from hundreds of annual reports

Consider, first, that the annual ELECTRONIC BUSINESS 200 report actually starts with the ELECTRONIC BUSINESS "400." Refining and updating the listings is actually a year-round chore. Every spring, letters go out to 400 companies requesting annual reports, quarterly reports, 10-K forms, and proxy statements. Linda and her helpers don't take no for an answer: They make an estimated 225 follow-up phone calls to slow-to-respond companies. And in the course of a year, Linda reads 7,000 to 8,000 pages of annual reports. (We don't recommend that you try this at home.)

In-depth research differentiates the ELECTRONIC BUSINESS 200 from the lists of top companies you'll find in some magazines that pull financial data from professional listing services. Is it all worth it? We think so, and the popularity of previous "top 200" issues tells us that you agree. This year's issue—a tale of pain and progress—should prove no exception.

The "pain," once again, refers to profitability—or rather, the lack thereof. Overall profit growth fell again for the third year in a row, and return on stockholders' equity fell a full percentage point from the previous year. The progress showed up in improved productivity and better margins.

A vital part of this report is the collection of charts and tables that rank companies by sales, profits, and best and worst performance. Many of the rankings will surprise you.

As a service to readers, current and prior versions of the ELECTRONIC BUSINESS 200 are available on disk—both IBM compatible Lotus 1-2-3 and Apple Macintosh Excel versions. The cost for any single year is $100, or $200 for any three years. To order, please phone Jean O'Brien at (617) 558-4257.

—John Parker, contributing editor

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BPA ABP

essing system that gives supercomputer performance at under $100 per Mflops (million floating-point operations per second).

—Barbara N. Berkman in London

AUTOMATION

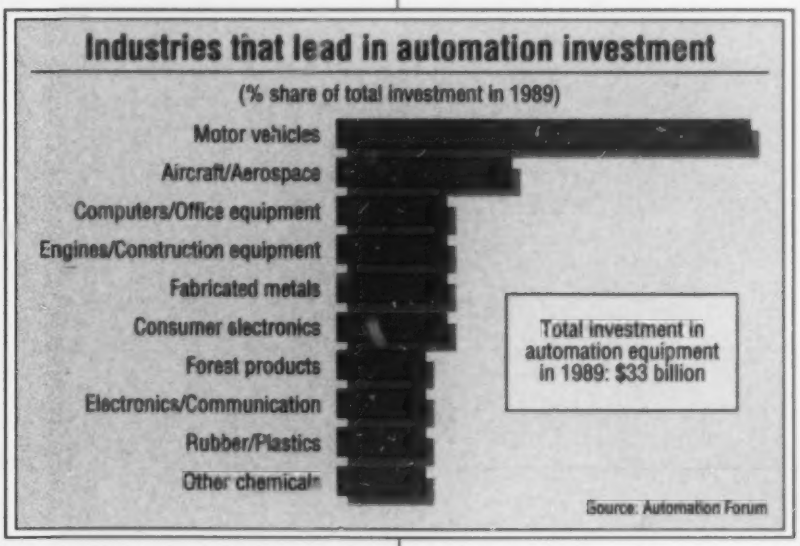
Tallying up a new industry

ONE OF THE PROBLEMS perpetually facing U.S. industry numbers-crunchers has been to define and measure everything from semiconductor sales to the trade deficit to how much and how well industry is investing in new technologies. Now the Automation Forum in Washington, D.C., a network of industry executives from nine U.S. trade associations, has published a study that attempts to define the automation marketplace and to put some hard figures on U.S. industries' spending.

According to the Automation Forum, U.S. industries spent $32.98 billion on automation investments in 1989. In fact, according to published data from the Commerce Department, investment spending on information processing equipment alone now accounts for 32 cents of every dollar spent on equipment by U.S. companies, up from 26 cents in 1980. This trend, which is likely to continue, points to the fact that investment spending plans clearly have and will continue to have a significant impact on the electronics industry's future.

Which industries are spending the most on automation? The top automation purchaser was the motor vehicles industry, which spent over $6 billion in 1989 to take 19% of the total U.S. automation spending. Aircraft and aerospace accounted for 8% of automation investment. High-tech industries (perhaps because they are newer and already automated) account for somewhat lower sales. The computer and office equipment industries accounted for just 5% of total automation spending in 1989. Electronics and communications took a 4% share.

—Elizabeth B. Baatz



SEMICONDUCTOR EQUIPMENT

Denser chips mean bigger bucks

ALTHOUGH A recession-cautious industry left the semiconductor equipment industry cooling its heels, a push toward higher density memory chips has finally started some cash registers ringing up a happier tune.

Semiconductor makers must anteup for newer generation equipment if they hope to compete in the emerging 16-megabit DRAM market. On the horizon is the need for equipment that can produce 64-Mbit DRAMs. New fabs are under construction around the world and must be filled with equipment that can process the bigger 8-inch wafers.

One example, Etec Systems Inc., in Hayward, Calif., reports sales are up 44% during the first half of 1990 over the same time last year, moving the company from losses to profitability and a $50 million order backlog.

Yet while the equipment industry is feeling some optimism, an abrupt turn in the road ahead could create a few navigational hazards. Customers are starting to push for open systems in production equipment called MESC (Modular Equipment Standards Committee).

That standard, which allows customers to mix and match equipment from various vendors, is beginning to take shape as companies such as Novellus Systems, Lam Research, and Materials Research offer MESC-compatible products.

—Teri Sprackland in San Jose

MICROPROCESSORS

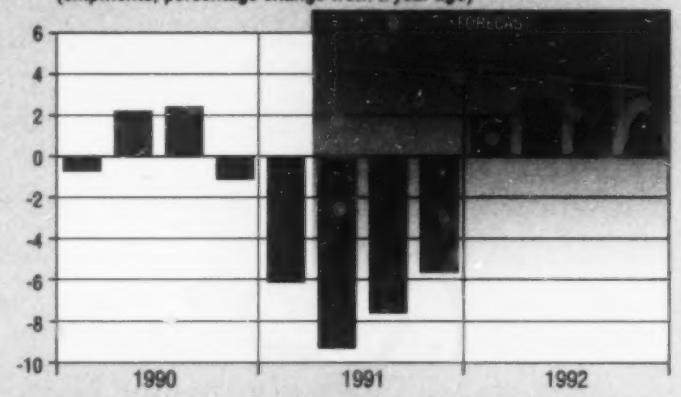
Ford Motor Co. and Motorola: goin' mobile

WITH ALL THE focus on the battle for the desktop reduced instructions set computing (RISC) market, and Motorola's lack of presence in same, the company's orphaned 88000 microprocessor found a friend in the most unlikely of places when Ford Motor Co. picked a version of the chip as its next Powertrain Electronics Controller.

Though the win won't generate any real sales for Motorola until the mid-1990s, the sheer volume of embedded controller sales—analysts estimate Ford's potential consumption at more than 6 million units per year—will boost the acceptance of architecture and allow the company

Military electronics market weakens in '91...

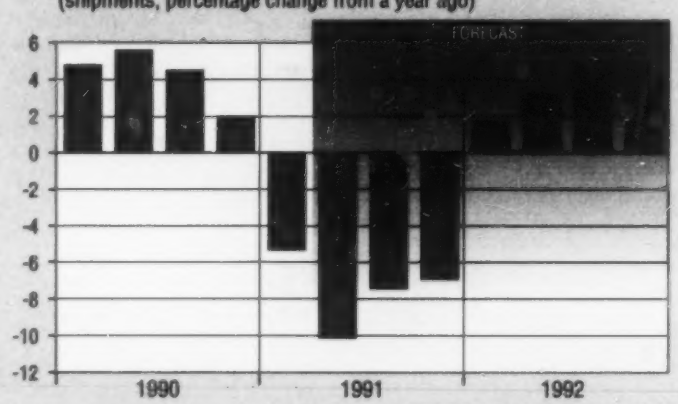
(shipments, percentage change from a year ago)



Source: Commerce Dept.; forecast: Cahners Economics

...before defense aircraft lifts off in '92...

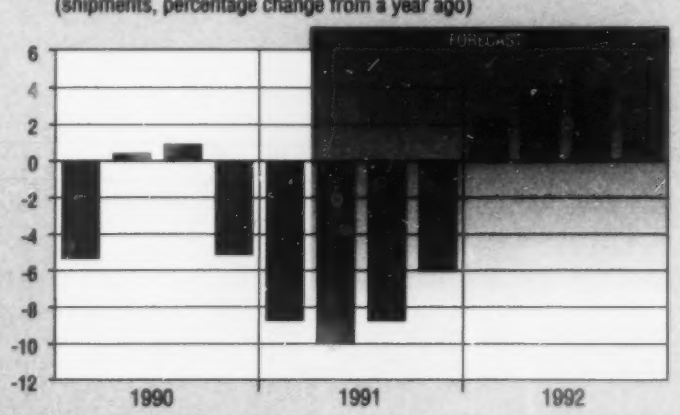
(shipments, percentage change from a year ago)



Source: Commerce Dept.; forecast: Cahners Economics

...and search & navigation equipment follows suit

(shipments, percentage change from a year ago)



Source: Commerce Dept.; forecast: Cahners Economics

Military electronics retreats to 1980 levels

PRODUCERS OF military electronics will have to bite the bullet in 1991 before sales stabilize in 1992. Recessions did not cut into government contract work in the past decade, but that is no longer true. The huge national debt has tied the hands of government officials so that federal spending will have no role in stimulating an economic expansion.

New orders for military electronics have already sounded the warning bell by plummeting 15.7% in 1990. The $50.2 billion worth of orders last year was the lowest dollar value of orders recorded since 1983. Shipments rose a mere 0.7% in 1990 to post a record $58 billion but, because of lower demand, will retreat 7.2% to $53.8 billion this year. The outlook for 1992 provides a slight recovery of 3.5% growth in shipments, to $55.7 billion. Taking inflation into account, however, this means sales will only stabilize.

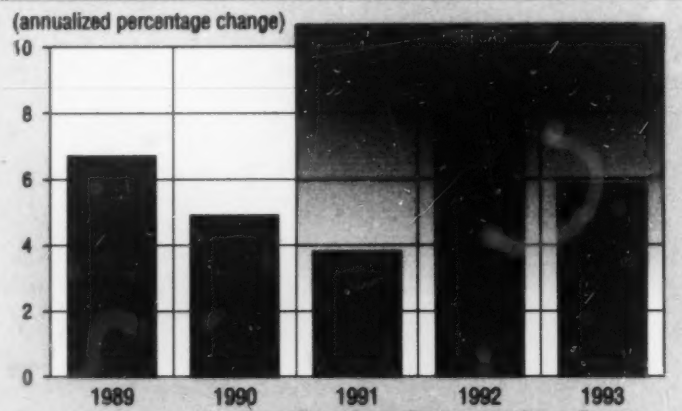
Despite being showcased in the Gulf war, the military aircraft, missiles, and parts market will fall 7.4% from $60.6 billion to $56.1 billion in 1991. According to the Aerospace Industries Association, sales of military aircraft alone are expected to fall 16.2% to $32.1 billion. When adjusted for inflation, this will be the lowest sales figure recorded since 1982.

Lofty cutbacks will also hit shipments of defense search and navigation equipment in 1991. Sales are forecast to decline 6% before a recovery of 4.9% is realized when new programs begin to take hold in 1992. Even after slight growth next year, military spending will remain a far cry from the peak spending levels that the market enjoyed in the mid-1980s.

—John Farrell

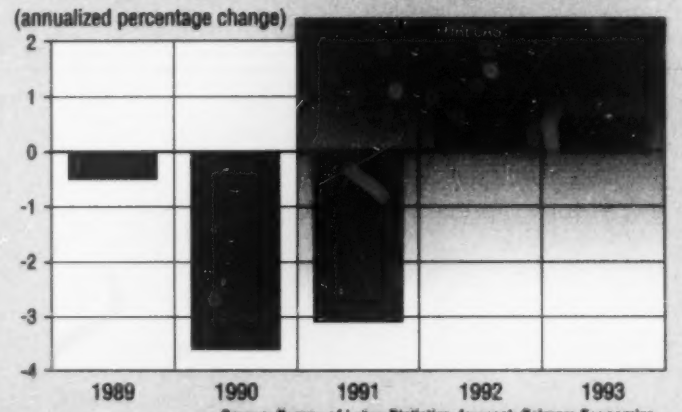
For more information on Cahners Economics' forecasts, contact Dan Buchan at (617) 630-2105 or by fax at (617) 630-2100.

As electronics production turns up...



Source: Federal Reserve Board; forecast: Cahners Economics

...employment will recover slowly too



Source: Bureau of Labor Statistics; forecast: Cahners Economics

A look at the employment forecast

	Number employed	annual % change		
	Dec. 1990	1991	1992	1993
Total	2,178,700	-3.1%	1.0%	0.6%
Instruments	840,800	-2.9	0.9	0.2
Components	568,700	-1.5	3.3	2.3
Computers & office equipment	432,400	-4.9	-1.8	-0.3
Communications	255,700	-4.3	-0.1	-0.5
Consumer	81,100	-3.0	3.1	0.8

Markets are categorized by *1987 Standard Industrial Classifications*; as a result, military electronics are included with instruments

Source: Bureau of Labor Statistics; forecast: Cahners Economics

Electronics employment to brighten (a bit) in '92

OUCH! EMPLOYMENT in the once-hardy electronics industry has certainly taken it on the chin. During the last recession in 1986, electronics employment fell 3.8%—the first time layoffs outraced new hires in the industry since 1975. With the cost-cutting and restructuring craze of the late 1980s, employment levels never fully recovered. Annual employment growth has risen only once in the four years since 1986, and then by only 0.9% in 1988. During the past year, the number of workers employed by the U.S. electronics manufacturing industry fell again by 3.1%, to 2.2 million.

Which electronics markets have been hardest hit by the latest cuts? Employment in the semiconductor and components sector tumbled 5.2% in 1990—on a par with the employment decline seen in the 1986 recession. The number of layoffs and early retirements in the computer and office equipment industry increased as well, as employment fell 4.3% in 1990. As of this past April, employment in this critical industry stood at only 424,000 workers—nearly the same as in 1980.

Now the electronics industry is preparing for the next upturn. Will employment grow again?

Yes, but slowly. The number of workers employed next year will remain below 1984 to 1985 employment levels. Cahners Economics' outlook calls for total electronics employment to have passed a low point in the second quarter of this year and slowly inch up thereafter. By the end of 1992, Cahners expects a meager—albeit encouraging—1% gain in employment. So, the exodus of employees in the industry will be coming to a halt, even though rehiring will see a slow and tedious recovery.

—Julie Handelman

INTRODUCTION

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By Linda Stallmann and Elizabeth B. Baatz

PROFITS take another PLUNGE

Productivity and margins rose nicely last year, but falling return on equity still plagues the industry

Restructuring. Customer satisfaction. Total quality. These buzzwords, sprinkled liberally throughout last year's crop of electronics company annual reports, all point toward fundamental changes in the way that U.S. electronics and computer companies are run.

As of last summer, those changes had not yet produced a payoff on the bottom line. But this year's economic analysis of the largest 200 U.S.-based electronics companies shows that early positive signs in both productivity and margins have emerged—in spite of a recession that finally erupted last year.

Productivity for the ELECTRONIC BUSINESS 200, as measured by sales per employee, rose 12% in fiscal 1990—up strongly from the prior year's subpar 4% gain. Gross manufacturing margins, after stumbling to 36.6% in fiscal 1989, bounced back last year to 39.2%. (Margins defined by ELECTRONIC BUSINESS include manufacturing costs of products, services, and rentals minus depreciation only.)

These results are a far cry from the previous year's doom and gloom. When ELECTRONIC BUSINESS analyzed the 200 financial statements of 1989, falling profits coupled with painfully slow productivity gains and falling margins painted a very bleak picture. This year's report at least shows some glimmers of hope.

Unfortunately, all the restructuring, downsizing, and attention to total quality have yet to show up on the bottom line. Profits growth for the top 200 electronics companies deteriorated for the third year in a row, and for the fifth time in the past seven years.

Even worse from the investor's point of view, return on equity averaged just 12.2% for the 200 in fiscal 1990 (meaning that a company earned 12 cents in profit for every stockholder's dollar invested). That's down a full percentage point from the previous year and a far cry from the 16.5% average return on equity during the industry's heyday in 1984.

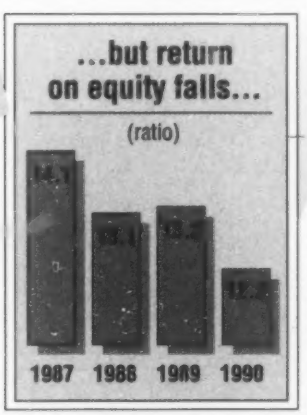
A falling return-on-equity ratio is particu-

larly disturbing because corporate debt for the 200 rose again to a record-breaking level last year. When debt rises, there is usually less likelihood that equity will rise to meet a firm's financing needs. Yet these aggregate debt figures, which include debt from firms such as E. I. DeNemours DuPont and Co. and Chrysler Corp., may not be as threatening as they first appear. The average debt burden among companies that sell mostly electronics products stands at a relatively comfortable 31.1%. Nonetheless, too much debt at large companies like Xerox and Unisys means big interest costs, which can hamper a company's future.

The upshot is that U.S. electronics companies are finding it harder than ever to make a buck. Last year's improved productivity and margins should have led to increased profits, but didn't. However, if productivity and margins continue to rise this year and next, rising profits won't be far behind.

THE TOP RANKS of the ELECTRONIC BUSINESS 200 have changed little over time. IBM and AT&T have maintained their #1 and #2 positions, respectively, since the first analysis of the ELECTRONIC BUSINESS 100 in 1978 (when AT&T's electronics division was known as Western Electric).

Last year, though, three electronics companies moved up one position each on the top 10: Xerox to #3, Hewlett-Packard to #4, and Motorola to #7. Making room for these climbers were Digital Equipment, which fell two positions to #5, and Unisys, which dropped one notch to #8. The top 10 companies accounted for 48% of the ELECTRONIC BUSINESS 200's electronics revenue and 39% of net income last year.



In fact, the top 10 ranks have long been an exclusive club. Eight of today's top 10 companies were so honored in 1984. Only two—GM Hughes Electronics and Unisys—have managed to break into the club, thanks to the disappearance of ITT (now #28) and Honeywell (still nipping at Texas Instruments' heels in position #11). The billion-dollar club has been a bit more hospitable: Today 63 companies generate over $1 billion in electronics revenue, 10 more companies than in 1984.

BUT SHEER COMPANY SIZE is not the primary goal of any CEO—performance is. And, as usual, size alone did not guarantee performance. Three companies in the top 10—Unisys, Digital Equipment, and Texas Instruments—collectively lost over $570 million last year. In fact, 38 companies lost money in calendar 1990 (up from 36 the year before and only 26 in 1987), and seven companies lost over $100 million each last year.

General Dynamics Corp. takes the dubious honor of biggest money-loser, with a net loss of $639 million in calendar 1990. The termination of the A-12 aircraft program and restructuring charges, as the company adapts to a shrinking military market, accounted for much of the loss. Restructuring also hit hard at Wang Laboratories and Unisys, where losses hit $584 million and $437 million, respectively.

While General Dynamics lost the most money, another military contractor—Lockheed Corp.—won the top spot for the largest percentage increase in profits from calendar 1989 to 1990; its profits rose from $6 million to $335 million. This year-to-year comparison is suspect, however, because Lockheed had significant write-offs involving fixed-price development programs in 1989.

The next three largest profit increases all came from the computer market. Dell Computer, AST Research, and Sun Microsystems all increased profits more than threefold last year. Dell Computer's

The biggest gainers

The ten largest increases in sales		200 rank
Conner Peripherals	89.8%	51
Borland International*	82.8	199
Northgate Computer*	82.3	192
Quantum	81.7	77
Maxtor	76.5	73
Pyramid Technology*	75.2	193
Archive	72.7	122
Thermo Electron*	71.2	160
Sequent Computer Systems*	70.9	163
Microsoft	55.1	47
The five largest increases in profits**		
Lockheed	5,483.3%	19
Dell Computer	432.5	87
AST Research	360.4	82
Sun Microsystems	317.7	30
Arrow Electronics	214.4	65

*New arrivals to the ELECTRONIC BUSINESS 200
**Excludes companies that lost money in calendar 1989

Calendar year — Source: ELECTRONIC BUSINESS

The biggest losers

The five largest decreases in sales		200 rank
Control Data	42.4%	44
Smith Corona	19.3	123
Recognition Equipment	15.5	189
Concurrent Computer	14.0	134
Micron Technology	13.8	120
The five largest decreases in profits*		
VLSI Technology	2,617.8%	124
Tektronix	2,557.4	49
Ultimate	1,862.0	197
Bally Manufacturing	1,232.3	146
Western Digital	635.7	60
The five largest losses ($ millions)		
General Dynamics	$639.0	59
Wang Laboratories	583.6	37
Unisys	436.7	8
Bally Manufacturing	292.3	146
National Semiconductor	169.6	43

*Decreases reflect swings from 1989 profits to 1990 losses

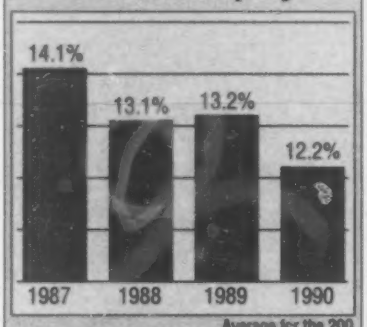
Calendar year — Source: ELECTRONIC BUSINESS

Composite performance of the ELECTRONIC BUSINESS 200

Calendar years	1985	1986	1987	1988	1989	1990
Electronics sales ($ billions)	$267.8	$279.2	$299.2	$327.7	$340.8	$362.3
Total sales ($ billions)	$797.8	$641.7	$689.7	$774.5	$814.9	$865.5
Net profits ($ billions)	$35.4	$26.7	$41.0	$39.7	$39.4	$38.0
Weighted average*	**1985**	**1986**	**1987**	**1988**	**1989**	**1990**
Return on equity	11.8%	10.2%	14.1%	13.1%	13.2%	12.2%
Return on investment	8.7%	7.2%	10.1%	7.2%	6.7%	5.7%
Cost of goods sold/sales	70.3%	63.7%	61.5%	58.6%	63.4%	60.8%
R&D/sales	4.2%	5.0%	5.2%	5.1%	5.5%	5.2%
Sales per employee	$110,800	$102,348	$113,533	$128,756	$133,941	$150,010
Net profits per employee	$5,000	$4,266	$6,662	$6,646	$6,761	$6,675
5-year compounded annual growth rate:						
Sales	5.0%	8.2%	10.7%	11.5%	7.7%	9.1%
Net profit	1.4%	4.0%	13.9%	8.3%	3.3%	5.4%
Capital outlays to net cash flow after dividends	118.3%	97.9%	73.9%	83.8%	95.0%	98.9%
Debt to capital	26.7%	29.9%	28.2%	45.3%	49.1%	53.2%
Foreign sales/total sales	14.0%	25.4%	24.9%	31.5%	32.3%	33.6%

*Fiscal year — Source: ELECTRONIC BUSINESS

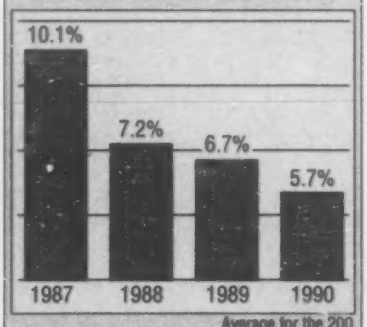
Return on equity



Average for the 200

The top five		200 rank
Smith Corona	50.0%	123
Reliance Electric	34.0	92
Apple Computer	32.8	13
Eli Lilly	32.5	89
Quantum	30.7	77
Median for the 200	11.3%	
The bottom five		
MAI Systems	-162.7%	116
Wang Laboratories	-151.5	37
Datapoint	-137.7	148
Daily Manufacturing	-87.9	146
Bolt Beranek & Newman	-80.6	150

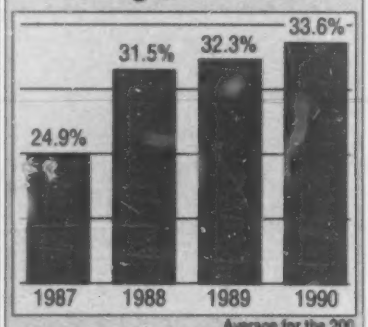
Return on investment



Average for the 200

The top five		200 rank
Quantum	30.7%	77
Apple Computer	30.3	13
Microsoft	30.2	47
Premier Industrial	29.0	108
Autodesk	26.0	171
Median for the 200	6.9%	
The bottom five		
Wang Laboratories	-60.7%	37
Datapoint	-58.8	148
Northgate Computer	-57.9	192
Data General	-26.6	56
Bolt Beranek & Newman	-26.5	150

Foreign/total sales



Average for the 200

The top five		200 rank
Tandon	95.8%	107
Datapoint	91.2	148
Atari	88.7	109
Molex	71.1	81
Micropolis	68.5	117
Median for the 200	36.1%	
The bottom five		
Penn Central	1.0%	93
Northgate Computer	3.0	192
Grumman	4.9	64
Zenith Electronics	6.1	48
Tandy	6.7	16

Fiscal year

Excludes companies with no foreign sales
Source: ELECTRONIC BUSINESS

profit growth, in particular, has not been a flash in the pan: Over the past five years, the company's profits, compounded annually, have grown 104%. Only three other companies—Intel, Seagate Technology, and Oracle Systems—managed to beat Dell in long-term profit gains.

Although profits have become tougher to generate in this maturing industry, many companies have excelled at growing revenue. One industry stands out from the others: disk drives. Three of the five companies that saw the largest percentage increase in sales from calendar 1989 to 1990 all make disk drives. Conner Peripherals, Quantum, and Maxtor each grew sales over 75% in 1990 from the prior year; only Maxtor failed to parlay that growth into a net income gain. Borland International and Northgate Computer, both newcomers to the 200, round out the list.

But the long-run sales growth prize goes to the computer market. When measuring sales growth compounded annually over the past five years, three computer companies outpaced everyone else—Encore Computer, Teradata (ELECTRONIC BUSINESS's fastest-growing company in 1990), and Sequent Computer Systems.

Which companies suffered the largest sales decline? Topping the list is high-speed-computer maker Control Data Corp., whose sales declined 42% to $1.7 billion in calendar 1990. As a result, Control Data fell from #24 on the list to #44. The company, in fact, has been struggling for some time and leads companies with the largest sales declines over the past five-year period.

Other companies that saw sharp sales declines from 1989 to 1990 include Smith Corona, Recognition Equipment, Concurrent Computer, and Micron Technology. In most cases, a decrease in sales led to red ink on the bottom line, although four companies of the top 10 in declining sales—Control Data, Smith Corona, Chrysler, and M/A-Com—managed to spin a profit last year.

Threatening trends seem to accompany every ELECTRONIC BUSINESS analysis. This year, the biggest worries may be the large

number of companies with excessive debt and the inability of the industry to grow profits. But the long-term health and competitiveness of the U.S. electronics industry may also be under fire from other directions:

- A growing dependence on revenue growth from activities other than manufacturing;
- A slowdown in foreign revenue growth;
- Insufficient long-term investment in capital spending;
- Continued deterioration in the industry's average return on investment.

These problems are not new, but the trends show they are getting worse. With respect to revenue growth, for example, ELECTRONIC BUSINESS recently documented Texas Instruments' increasing dependence on royalty income rather than operating income ("How TI attacks the global market," May 6, 1991). IBM also is growing less from product sales and more from other revenue streams. In 1990, for example, IBM's total revenue grew 10.1%, but product sales rose only 5.7%. IBM managed to eke out double-digit growth last year due

Industry segments tell a mixed tale

A LOOK AT THE trends within the ELECTRONIC BUSINESS 200's industry segments can be revealing. In software, for example, the number of companies rose from 10 in 1989 to 13 in 1990 with the addition of Autodesk, Borland International, and Cadence Design Systems. Three companies—Convex Computer, Pyramid Technology, and Sequent Computer Systems—joined the mainframe computer segment, now 10 companies strong.

Nearly all industry segments enjoyed higher productivity. Sales per employee increased for every segment except distribution, peripherals, and software. But comparisons between 1989 and 1990 can sometimes be misleading. The addition of distributors Bell Industries Inc. and Premier Industrial Corp. to the 200, for example, brought the productivity average down for the entire distribution segment. Actually, all six original distribution companies on 1989's list saw significant improvement in productivity in fiscal 1990. Desktop computers showed the most dramatic rise in productivity, with sales rising from an average $168,200 per employee to $263,600, to gain the title of the most productive industry segment.

Other good news includes the fact that cost-cutting paid off in gross margins. Nine of the 16 segments reduced their cost of goods and improved margins. Traditionally high-cost segments such as distribution and peripherals lowered their costs from fiscal 1989 to 1990: Distribution fell from 75.7% to 72.3% and peripherals from 72.4% to 70.2%. The software industry, which has the lowest manufacturing costs of all segments, saw an already low 17.5% cost fall

Comparing industry segments

Productivity

Sales per employee ($ thousands)	1990	1989
Desktop computers	$263.6	$168.2
Distribution	255.9	273.9
Software	173.7	183.6
Mainframes	169.0	153.1
Diversified	157.5	140.5
Computer-based systems	141.1	116.2
Medical	133.0	117.8
Office equipment	131.0	117.9
Minicomputers	112.9	104.5
Communications	110.3	95.3
Consumer	108.9	101.3
Instruments	108.5	105.0
Government	107.5	100.3
Peripherals	104.4	138.0
Semiconductors	100.7	94.2
Components	86.9	84.3

Fiscal year

Cost of goods sold

(as % of sales)	1990	1989
Distribution	72.3%	75.7%
Government	71.7	70.7
Peripherals	70.2	72.4
Consumer	65.2	65.2
Components	62.5	61.4
Instruments	58.5	52.1
Semiconductors	57.6	58.0
Communications	55.3	54.8
Desktop computers	50.0	51.1
Computer-based systems	49.5	52.6
Minicomputers	44.7	42.9
Office equipment	42.6	42.3
Diversified	42.3	42.6
Mainframes	40.9	42.5
Medical	40.2	41.0
Software	15.8	17.5

Fiscal year

All figures are weighted averages. For list of companies in each segment, see detailed industry segment tables

to a 14.8% increase in support services, an 18.1% jump in software, and a 33.2% surge in rentals and financing revenue. These nonmanufacturing revenue categories accounted for 36% of total revenue, up from 33% two years before. While IBM has protected itself by growing nonmanufacturing revenue, one wonders whether this reflects a blow to the competitive standing of U.S. manufacturing.

The recent slowdown in foreign sales by U.S.-based electronics companies poses a greater threat than ever, since U.S. companies rely on foreign revenue growth to offset slow domestic sales. Indeed, 38 companies on the 200 list received more than half of their sales dollars from foreign buyers; another 64 companies relied on foreign sales for more than a third of their revenue. A slowdown in international markets thus could have a profound effect on company performance.

At Digital Equipment, for example, sales to Europe grew 21.5% in fiscal 1989 but slowed to a meager 2.2% in 1990. Other foreign revenue slowed from 22.2% to a disappointing 6.4% over the same period. The result: Digital Equipment lost $94 million in calendar 1990 and dropped from #3 on the list to #5.

Struggling to adapt from a mammoth microcomputer company to a market-driven technology company, Digital Equipment may be a unique case. But the lesson is here to be learned: Foreign sales may not be the future salvation of U.S. electronics companies.

The tendency of U.S. companies to underinvest in new plants and equipment also has become more worrisome every year. Jerry Wasserman, vice president of consultants Arthur D. Little Inc. in Cambridge, Mass., has been sounding the warning for ELECTRONIC BUSINESS since 1987. The ratio of capital expenditures to net cash flow after dividends shows how a company uses internally generated funds to support capital spending. A ratio below 100 in the electronics industry generally indicates inadequate investment, says Wasserman. And the 200's capital-spending ratio has been below 100 for five years now.

Of course, the biggest critic of the U.S. high-tech companies continues to be Wall Street. And who can blame them? Return on investment for the 200 dropped to an average 5.7%, one percentage point below 1989 and the lowest return ever. While stars such as Quantum, Apple Computer, and Microsoft shine with returns on investment greater than 30%, the electronics industry must perform better overall if it hopes to regain investors' confidence.

On a more positive note, this year's ELECTRONIC BUSINESS 200 reveals the first signs of promise from restructuring and attention to quality. An increase in productivity and improved margins are exactly the statistics one would expect to see turn around first. The next step: improving profitability. □

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to 15.8%. The hard-hit minicomputer industry saw cost of sales rise from 42.9% in 1989 to 44.7% in 1990. Other industries that increased costs were government, components, instruments and measurement, communications, and office equipment.

Half of the industry segments enjoyed rising profitability and the other half suffered declines, with one segment actually registering a net loss. Software has always led, and still leads, the entire electronics industry in profits as a percent of sales, although profitability fell from 12.1% in calendar 1989 to 9.9% in 1990. But the gap narrowed as medical equipment makers improved their position to #2 by boosting profitability from 6.3% in 1989 to 8.6% in 1990. Thus, the software industry's advantage is rapidly disappearing as medical equipment and desktop computer makers improve their profitability. One of the biggest drops was again the minicomputer industry with profits as a percent of sales dropping from 3.7% in 1989 to -3.8% in 1990.

—Linda Stallmann

Profitability

(net profit/sales,%)	1990	1989
Software	9.9%	12.1%
Medical	8.6	6.3
Desktop computers	8.3	7.1
Diversified	7.5	5.2
Mainframes	6.9	3.7
Components	6.5	6.3
Computer-based systems	5.6	5.9
Office equipment	4.7	4.1
Communications	4.0	4.9
Distribution	3.9	2.4
Government	3.7	4.7
Semiconductors	3.3	4.8
Peripherals	3.3	1.3
Instruments	3.1	6.8
Consumer	2.5	4.3
Minicomputers	-3.8	3.7

Calendar year

Source: ELECTRONIC BUSINESS

THE ELECTRONIC BUSINESS 200

FINANCIAL TABLES 1-50

Rank 1990	Rank 1989	Company	Location	Calendar year 1990: Electronics sales ($ millions)	Total sales ($ millions)	Net profits ($ millions)	Profits % of sales	Fiscal year 1990: Return on assets	Return on equity
1	1	**IBM**	Armonk, N.Y.	$69,018	$69,018.0	$6,020.0	8.7%	6.9%	14.1%
2	2	**AT&T**	New York	16,832	37,285.0	2,735.0	7.3	6.2	19.4
3	4	**Xerox**	Stamford, Conn.	13,583	13,583.0	599.0	4.4	1.9	9.8
4	5	**Hewlett-Packard**	Palo Alto, Calif.	13,538	13,538.0	771.0	5.7	6.5	11.6
5	3	**Digital Equipment**	Maynard, Mass.	13,072	13,072.3	-94.5	-0.7	0.6	0.9
6	6	**GM Hughes Electronics**	Detroit	11,723	11,723.1	577.2	4.9	4.5	7.1
7	8	**Motorola**	Schaumburg, Ill.	10,885	10,885.0	499.0	4.6	5.7	11.7
8	7	**Unisys**	Blue Bell, Pa.	10,111	10,111.3	-436.7	-4.3	-4.2	-12.5
9	9	**General Electric**	Fairfield, Conn.	9,430	58,414.0	4,303.0	7.4	2.8	19.8
10	10	**Texas Instruments**	Dallas	6,567	6,567.0	-39.0	-0.6	-0.8	-1.7
11	11	**Honeywell**	Minneapolis	6,309	6,309.1	371.8	5.9	7.8	21.9
12	12	**NCR**	Dayton, Ohio	6,285	6,285.0	369.0	5.9	8.1	20.6
13	13	**Apple Computer**	Cupertino, Calif.	5,741	5,740.6	500.6	8.7	16.0	32.8
14	14	**Raytheon**	Lexington, Mass.	5,517	9,267.7	557.3	6.0	9.1	19.6
15	15	**Rockwell International**	El Segundo, Calif.	5,022	12,431.8	620.0	5.0	6.4	14.9
16	16	**Tandy**	Ft. Worth	4,648	4,648.1	263.3	5.7	9.0	16.8
17	17	**Eastman Kodak**	Rochester, N.Y.	4,140	18,908.0	703.0	3.7	2.9	10.4
18	23	**Intel**	Santa Clara, Calif.	3,921	3,921.3	650.3	16.6	12.1	18.1
19	18	**Lockheed**	Calabasas, Calif.	3,880	9,958.0	335.0	3.4	4.9	14.5
20	27	**Compaq Computer**	Houston	3,599	3,598.8	454.9	12.6	16.7	24.5
21	21	**3M**	St. Paul	3,530	13,021.0	1,308.0	10.0	11.8	21.4
22	19	**Ford Motor**	Dearborn, Mich.	3,250	97,650.0	860.1	0.9	0.5	3.7
23	29	**Westinghouse Electric**	Pittsburgh	3,196	12,915.0	268.0	2.1	1.2	6.9
24	20	**Litton Industries**	Beverly Hills, Calif.	3,166	5,155.6	169.9	3.3	3.4	13.8
25	30	**Harris**	Melbourne, Fla.	3,065	3,064.9	36.0	1.2	5.0	12.1
26	22	**Martin Marietta**	Bethesda, Md.	2,983	6,125.9	327.6	5.3	10.4	21.3
27	28	**TRW**	Cleveland	2,980	8,169.0	208.0	2.5	3.7	10.9
28	26	**ITT**	New York	2,925	20,604.0	1,056.0	5.1	2.2	12.4
29	25	**Allied-Signal**	Morristown, N.J.	2,840	12,343.0	462.0	3.7	4.4	13.7
30	39	**Sun Microsystems**	Mountain View, Calif.	2,763	2,762.8	151.0	5.5	6.3	12.0
31	40	**Seagate Technology**	Scotts Valley, Calif.	2,668	2,667.6	99.7	3.7	6.3	17.4
32	32	**Boeing**	Seattle	2,600	27,595.0	1,385.0	5.0	9.5	19.9
33	33	**AMP**	Harrisburg, Pa.	2,587	3,043.6	287.1	9.4	9.8	16.0
34	36	**GTE**	Stamford, Conn.	2,500	18,374.0	1,541.0	8.4	4.6	16.9
35	34	**DuPont**	Wilmington, Del.	2,480	40,047.0	2,310.0	5.8	6.1	14.1
36	35	**Emerson Electric**	St. Louis	2,396	7,727.9	618.1	8.0	9.6	20.5
37	31	**Wang Laboratories**	Lowell, Mass.	2,369	2,368.7	-583.6	-24.6	-32.3	-151.5
38	37	**Pitney Bowes**	Stamford, Conn.	2,283	3,195.6	213.3	6.7	3.4	13.0
39	38	**Amdahl**	Sunnyvale, Calif.	2,159	2,158.8	184.0	8.5	7.9	13.4
40	42	**McDonnell Douglas**	St. Louis	1,915	15,255.0	275.0	1.7	1.8	7.8
41	41	**Tandem Computers**	Cupertino, Calif.	1,873	1,873.1	98.1	5.2	6.5	10.1
42	54	**Loral**	New York	1,789	1,789.3	84.8	4.7	5.1	13.3
43	43	**National Semiconductor**	Santa Clara, Calif.	1,731	1,730.7	-169.6	-9.8	-2.1	-3.6
44	24	**Control Data**	Minneapolis	1,691	1,691.0	2.7	0.2	0.2	0.6
45	46	**E-Systems**	Dallas	1,650	1,810.2	94.3	5.2	9.7	15.1
46	44	**Avnet**	Great Neck, N.Y.	1,547	1,756.4	56.6	3.2	4.9	7.3
47	61	**Microsoft**	Redmond, Wash.	1,478	1,477.8	355.6	24.1	25.3	30.4
48	45	**Zenith Electronics**	Glenview, Ill.	1,410	1,409.9	-53.2	-3.8	-7.2	-15.3
49	47	**Tektronix**	Beaverton, Ore.	1,396	1,395.9	-70.1	-5.0	-9.5	-24.1
50	58	**Johnson Controls Inc.**	Milwaukee	1,350	4,581.5	88.6	1.9	3.3	8.9

NA = not available
NM = not meaningful

* compounded average annual growth rate
** See "Notes to the ELECTRONIC BUSINESS 200" on page 67.

Return on investment	Cost of goods % of sales	R & D % of sales	Sales/ employee ($thousands)	Profits/ employee ($thousands)	Five-year growth (CAAGR)* sales	profits	Capital outlays to net cash flow after dividends	Debt to capital	Foreign sales % of sales	Fiscal year ended	Industry segment codes**
9.7%	36.8%	9.5%	$184.6	$16.1	6.4%	-1.7%	76.1%	31.3%	60.7%	12/90	7, 10
13.4	34.5	6.5	136.2	10.0	1.6	11.9	76.7	30.9	0.0	12/90	—
3.6	43.9	6.2	137.2	6.1	8.4	9.9	48.2	63.0	50.7	12/90	13
8.8	48.6	10.3	143.8	8.0	15.3	8.6	79.4	24.2	54.4	10/90	7, 1
0.9	46.3	12.5	104.4	0.6	14.1	-30.1	118.0	1.9	56.3	6/90	12
6.4	70.8	4.8	122.1	6.0	4.3	29.3	113.3	10.8	16.2	12/90	8
8.3	56.0	9.3	103.7	4.8	14.8	47.3	105.6	29.6	54.2	12/90	2, 15
-6.1	60.0	7.4	134.3	-5.8	15.0	NM	-334.4	51.7	51.8	12/90	10
5.0	49.4	2.5	196.0	14.4	12.4	13.6	88.1	74.7	25.9	12/90	—
-1.3	72.9	8.2	93.4	-0.6	5.9	NM	222.8	24.1	33.2	12/90	8, 15
15.3	63.8	4.4	104.6	6.2	8.4	15.7	45.8	29.9	31.8	12/90	7, 9
16.0	49.2	8.0	114.3	6.7	7.8	3.2	67.0	22.6	61.9	12/90	7, 10
30.3	43.2	8.6	382.6	32.7	23.7	50.6	36.0	7.8	41.7	9/90	5
12.9	76.5	2.9	120.8	7.3	7.7	8.2	55.5	34.1	17.4	12/90	8
11.3	74.3	13.7	121.5	6.1	1.8	1.0	51.3	24.5	26.2	9/90	—
10.9	50.9	0.0	115.4	7.4	11.6	9.0	33.8	35.5	6.7	6/90	4
5.0	51.1	7.0	140.6	5.2	12.2	16.2	14.9	52.5	46.5	12/90	—
15.4	41.8	13.2	164.1	27.2	23.5	233.8	72.1	14.8	46.0	12/90	15
7.8	48.5	4.5	136.4	4.6	1.5	-3.4	57.7	46.3	7.1	12/90	—
23.5	53.4	5.2	315.7	39.9	48.2	76.5	55.0	3.8	53.9	12/90	5
17.2	52.3	6.6	145.3	14.6	9.9	14.5	88.5	19.7	47.8	12/90	—
0.7	75.4	3.6	263.6	2.3	13.1	-19.3	210.2	80.4	36.7	12/90	—
1.7	76.3	1.5	111.3	2.3	2.8	-14.8	167.8	75.8	21.3	12/90	—
11.3	73.7	3.2	101.9	3.5	2.4	-9.8	48.6	18.0	26.5	7/90	8
7.1	58.7	4.8	91.4	3.9	9.2	10.2	70.0	41.0	27.8	6/90	7, 8
16.1	78.8	3.5	98.8	5.3	6.7	5.6	57.4	24.3	0.0	12/90	—
5.9	73.4	3.8	108.1	2.8	6.7	9.2	106.1	45.7	31.2	12/90	—
5.8	83.8	2.7	180.7	9.3	0.6	29.1	57.3	52.7	31.5	12/90	—
7.5	82.7	5.8	116.7	4.4	8.6	NM	286.8	44.8	38.8	12/90	—
8.5	48.8	12.2	214.6	9.7	84.5	67.1	69.1	29.0	57.1	6/90	5
9.4	74.8	4.3	63.5	3.1	62.2	157.0	39.7	46.0	35.3	6/90	14
19.0	84.6	3.0	170.7	8.6	15.0	19.6	91.4	4.3	58.3	12/90	—
12.9	59.0	8.6	123.2	11.6	13.2	21.6	93.9	19.7	59.3	12/90	3
6.9	59.1	1.5	119.3	10.0	5.0	NM	107.5	59.2	16.6	12/90	—
8.9	50.7	3.6	278.2	16.0	6.3	15.6	140.6	36.9	54.3	12/90	—
13.9	62.5	3.1	102.8	8.3	9.0	6.1	51.5	32.1	36.1	9/90	—
-60.7	48.5	8.9	123.7	-31.1	1.4	NM	-37.2	59.9	52.5	6/90	12
4.5	30.3	3.4	106.7	6.9	12.3	9.8	97.1	65.1	23.4	12/90	13
12.6	50.6	14.4	241.2	20.6	20.2	49.8	94.6	6.2	47.9	12/90	10
3.0	81.1	3.8	134.1	2.3	7.4	-4.5	54.3	61.4	21.8	12/90	—
8.6	28.9	13.6	170.6	11.1	24.0	29.4	120.5	15.2	55.6	9/90	12
7.6	52.4	5.5	100.3	6.1	20.5	13.0	44.9	42.8	29.0	3/90	8
-3.3	64.0	15.1	51.2	-0.9	7.1	NM	129.4	8.5	45.4	5/90	15
0.3	59.7	7.5	116.6	0.2	-14.4	NM	33.2	44.0	32.4	12/90	10, 7
12.5	82.6	0.0	98.2	5.1	14.3	9.6	50.5	17.0	7.2	12/90	8
5.8	73.3	0.0	233.5	7.5	2.7	2.7	27.0	21.0	0.0	6/90	6
30.2	17.4	15.3	210.0	49.5	53.2	63.2	48.6	0.7	54.9	6/90	16
-10.6	89.0	4.0	52.2	-1.9	1.3	NM	-240.0	30.7	6.1	12/90	4
-14.3	46.7	13.8	101.0	-6.6	-0.4	NM	-263.3	40.4	46.2	5/90	9
5.1	81.3	1.4	103.5	2.1	20.6	6.2	110.6	43.0	17.2	9/90	—

(continued)

THE ELECTRONIC BUSINESS 200

FINANCIAL TABLES 51-100

Rank 1990	Rank 1989	Company Location	Calendar year 1990 Electronics sales ($ millions)	Total sales ($ millions)	Net profits ($ millions)	Profits % of sales	Fiscal year 1990 Return on assets	Return on equity
51	73	**Conner Peripherals** San Jose	$1,338	$1,337.6	$130.1	9.7%	14.8%	21.5%
52	52	**Computer Associates** Garden City, N.Y.	1,311	1,310.7	162.0	12.4	10.9	15.9
53	48	**Varian Associates** Palo Alto, Calif.	1,296	1,295.5	16.8	1.3	1.4	3.1
54	53	**United Technologies** Hartford	1,265	21,442.0	750.6	3.5	4.7	14.0
55	50	**Chrysler** Highland Park, Mich.	1,265	30,620.0	66.0	0.2	0.1	1.0
56	51	**Data General** Westborough, Mass.	1,237	1,237.4	-106.9	-8.6	-15.4	-34.5
57	56	**SCI Systems** Huntsville, Ala.	1,175	1,175.3	13.5	1.2	0.4	1.3
58	59	**Storage Technology** Louisville, Colo.	1,141	1,140.6	70.6	6.2	6.7	13.3
59	55	**General Dynamics** St. Louis	1,095	10,173.0	-639.0	-6.3	-9.7	-42.3
60	60	**Western Digital** Irvine, Calif.	1,066	1,066.5	-78.6	-7.4	3.8	7.5
61	57	**Advanced Micro Devices** Sunnyvale, Calif.	1,059	1,059.2	-53.6	-5.1	-4.8	-8.4
62	72	**Oracle Systems** Redwood Shores, Calif.	1,059	1,058.9	57.4	5.4	14.9	30.3
63	69	**Intergraph** Huntsville, Ala.	1,045	1,044.6	62.6	6.0	6.9	9.2
64	65	**Grumman** Bethpage, N.Y.	990	3,990.4	85.6	2.1	3.5	9.5
65	63	**Arrow Electronics** Melville, N.Y.	971	970.9	10.1	1.0	2.1	6.7
66	62	**Teledyne** Los Angeles	940	3,445.8	69.2	2.0	4.2	13.2
67	66	**Eaton** Cleveland	930	3,639.0	169.0	4.6	5.6	14.8
68	67	**Northrop** Los Angeles	923	5,489.8	210.4	3.8	6.8	20.4
69	70	**Beckman Instruments** Fullerton, Calif.	815	815.2	36.2	4.4	5.3	11.1
70	75	**Medtronic** Minneapolis	811	976.8	124.2	12.7	12.7	20.1
71	71	**Cray Research** Eagan, Minn.	804	804.4	113.0	14.0	12.0	18.0
72	64	**General Signal** Stamford, Conn.	800	1,694.9	-13.3	-0.8	-1.0	-2.9
73	93	**Maxtor** San Jose	789	789.4	10.8	1.4	4.9	12.1
74	86	**Corning** Corning, N.Y.	783	2,940.5	289.1	9.8	8.2	15.6
75	78	**EG&G** Wellesley, Mass.	762	2,474.3	74.0	3.0	11.0	20.0
76	68	**Emerson Radio**[1] North Bergen, N.J.	735	735.0	NA	0.0	3.1	11.0
77	109	**Quantum** Milpitas, Calif.	716	716.3	66.7	9.3	19.4	30.7
78	74	**Perkin-Elmer** Norwalk, Conn.	711	863.2	46.9	5.4	5.2	11.3
79	81	**Lotus Development** Cambridge, Mass.	685	684.5	23.3	3.4	3.5	7.5
80	82	**LSI Logic** Milpitas, Calif.	655	655.5	-34.0	-5.2	-4.3	-12.3
81	80	**Molex** Lisle, Ill.	649	649.2	65.9	10.1	10.2	12.9
82	88	**AST Research** Irvine, Calif.	586	586.5	52.5	9.0	10.8	18.1
83	79	**Scientific-Atlanta** Atlanta	574	574.5	34.0	5.9	11.4	15.9
84	83	**Applied Materials** Santa Clara, Calif.	573	572.9	27.2	4.7	6.1	11.3
85	84	**Marshall Industries** El Monte, Calif.	565	564.6	19.1	3.4	9.0	14.9
86	85	**Raychem** Menlo Park, Calif.	560	1,196.3	-117.0	-9.8	-8.8	-16.1
87	111	**Dell Computer** Austin, Tex.	546	546.2	27.2	5.0	10.3	24.3
88	97	**Novell** Provo, Utah	526	526.3	109.7	20.8	19.1	23.7
89	105	**Eli Lilly** Indianapolis	520	5,191.6	1,127.3	21.7	15.8	32.5
90	96	**DSC Communications** Plano, Tex.	519	519.3	20.3	3.9	2.7	7.3
91	92	**Analog Devices** Norwood, Mass.	509	508.7	-10.0	-2.0	-2.7	-3.8
92	115	**Reliance Electric** Cleveland	500	1,547.0	49.0	3.2	4.2	34.0
93	89	**Penn Central** Cincinnati	490	2,154.3	97.8	4.5	2.8	6.0
94	95	**Westmark International** Seattle	485	484.9	18.7	3.9	4.1	5.9
95	103	**Dynatech** Burlington, Mass.	485	484.8	17.5	3.6	5.4	10.8
96	122	**Silicon Graphics** Mountain View, Calif.	482	482.1	39.8	8.3	8.9	13.2
97	94	**Monsanto** St. Louis	475	8,995.0	546.0	6.1	5.9	13.4
98	87	**Teradyne** Boston	459	458.9	-21.3	-4.6	-5.5	-7.8
99	99	**United Telecomm** Kansas City, Mo.	455	8,345.1	308.7	3.7	2.9	13.4
100	102	**Vishay Intertechnology** Malvern, Pa.	446	445.6	23.2	5.2	5.3	13.0

NA = not available
NM = not meaningful
[1]calendar year electronics sales and total sales are ELECTRONIC BUSINESS estimates

* compounded average annual growth rate
** See "Notes to the ELECTRONIC BUSINESS 200" on page 67.

Return on investment	Cost of goods % of sales	R & D % of sales	Sales/ employee ($thousands)	Profits/ employee ($thousands)	Five-year growth (CAAGR)* sales	profits	Capital outlays to net cash flow after dividends	Debt to capital	Foreign sales % of sales	Fiscal year ended	Industry segment codes**
20.2%	72.9%	4.7%	$140.8	$13.7	NA	NA	57.8%	6.3%	49.0%	12/90	14
15.5	-8.5	13.2	187.8	22.9	41.6%	48.9%	8.5	3.0	48.0	3/90	16
2.6	65.7	6.1	124.0	1.2	7.5	-22.9	112.4	17.8	41.5	9/90	9, 7
8.4	71.5	4.8	111.3	3.9	7.4	3.4	102.4	40.0	36.6	12/90	—
0.2	71.8	3.0	278.5	0.6	7.6	-47.1	149.9	77.0	12.2	12/90	—
-26.6	47.1	11.6	114.8	-13.2	-0.4	NM	-420.9	22.9	52.0	9/90	12
0.5	89.8	3.4	110.3	0.2	17.0	-30.0	164.9	64.5	35.9	6/90	—
9.5	58.1	8.6	125.3	7.8	11.1	NM	32.9	28.8	42.1	12/90	14
-24.1	92.8	3.8	103.7	-6.5	4.9	NM	-106.3	43.0	0.0	12/90	—
5.0	71.1	7.7	140.7	3.2	41.4	NM	120.5	32.8	45.6	6/90	14
-6.5	51.9	19.2	88.3	-4.5	5.9	NM	472.5	23.2	35.7	12/90	15
22.6	12.0	9.1	142.5	17.2	111.1	137.6	55.3	25.4	49.3	5/90	16
8.9	45.9	10.5	108.8	6.5	14.7	-1.6	67.7	3.0	47.2	12/90	5
5.1	90.2	2.9	152.9	3.3	5.2	1.0	32.4	46.5	4.9	12/90	—
2.8	77.7	0.0	425.9	4.4	13.8	NM	34.3	58.4	0.0	12/90	6
6.7	77.7	1.8	103.8	2.1	1.1	-33.9	98.0	49.4	11.1	12/90	—
8.6	71.1	3.5	99.4	4.6	5.4	-2.8	68.1	41.7	24.3	12/90	—
10.4	83.1	2.8	143.7	5.5	1.7	-0.4	35.6	48.9	0.0	12/90	—
8.6	42.8	9.9	115.6	5.1	8.2	6.6	88.9	22.5	54.9	12/90	11
17.1	27.8	9.5	123.5	16.0	18.1	23.3	42.8	14.8	39.6	4/90	11
14.7	23.2	16.0	165.6	23.3	16.2	8.5	22.2	18.4	40.7	12/90	10
-1.5	67.7	6.1	107.3	-0.8	1.0	NM	495.6	47.6	19.1	12/90	—
6.4	72.1	7.2	104.4	4.0	56.7	NM	103.3	47.4	33.0	3/90	14
11.5	58.3	4.2	102.8	10.1	10.9	21.2	66.7	26.4	28.1	12/90	—
15.9	86.5	0.9	82.5	2.5	15.6	4.5	24.2	20.5	7.0	12/90	—
3.3	89.6	0.0	800.2	9.3	20.2	-7.7	30.4	69.7	0.0	3/90	4
30.7	69.3	5.8	584.9	61.9	30.0	17.6	31.8	0.0	32.0	3/90	14
7.8	49.0	7.6	130.0	6.9	12.4	15.0	31.6	31.0	53.0	7/90	9
4.9	12.9	15.0	195.6	6.6	24.9	-9.4	67.1	34.9	47.6	12/90	16
-6.5	56.4	9.2	149.0	-7.7	36.2	NM	73.9	47.5	43.8	12/90	15
12.7	47.7	5.5	88.4	9.2	18.6	15.0	62.8	1.9	71.1	6/90	3
15.6	65.4	3.5	230.9	15.2	31.0	13.0	24.0	14.0	34.4	6/90	5
15.5	63.9	6.5	170.6	12.3	7.1	22.0	50.8	2.5	19.0	6/90	2
8.9	50.4	17.1	172.9	10.4	26.6	30.0	221.9	21.2	54.6	10/90	—
11.3	76.0	0.0	341.9	12.6	15.4	31.2	72.4	24.4	0.0	5/90	6
-12.3	43.6	11.0	100.7	-10.1	10.4	NM	-247.3	23.6	63.4	6/90	—
22.9	65.0	4.1	271.4	13.5	74.6	104.4	26.2	6.0	34.3	1/91	5
23.4	22.2	11.9	194.6	36.9	55.2	80.4	24.2	1.1	39.6	10/90	16
22.6	24.6	13.5	173.6	37.7	15.6	18.0	108.9	30.4	36.1	12/90	—
3.7	55.8	10.0	128.4	5.0	24.3	NM	116.9	49.3	10.8	12/90	2
-3.4	40.7	16.6	85.1	-2.3	8.5	NM	112.8	8.7	53.0	10/90	15
6.4	68.1	5.9	110.5	3.5	6.0	30.4	48.8	81.1	14.1	12/90	—
4.5	49.0	0.0	109.4	5.0	8.7	4.5	43.2	24.3	1.0	12/90	—
5.8	49.7	11.8	133.6	4.5	20.6	NM	62.4	2.8	31.5	12/90	11
6.8	44.4	9.6	144.7	4.9	12.6	-5.7	44.1	37.0	26.7	3/90	2
11.4	39.8	10.9	200.0	15.4	66.8	NM	54.4	13.7	43.4	6/90	5
8.6	51.4	6.8	219.0	13.3	5.9	NM	71.9	35.3	42.3	12/90	—
-7.0	54.1	14.6	104.3	-4.8	3.1	NM	180.9	10.5	43.3	12/90	9
4.6	74.4	0.0	193.6	7.2	89.4	53.7	133.1	65.9	0.0	12/90	—
6.7	62.9	1.5	53.6	2.7	51.8	24.0	62.6	48.6	45.0	12/90	3

(continued)

THE ELECTRONIC BUSINESS 200

FINANCIAL TABLES 101-150

Rank 1990	Rank 1989	Company Location	Calendar year 1990: Electronics sales ($ millions)	Total sales ($ millions)	Net profits ($ millions)	Profits % of sales	Fiscal year 1990: Return on assets	Return on equity
101	104	**3Com** Santa Clara, Calif.	$437	$437.4	$23.9	5.5%	7.0%	8.8%
102	113	**Mentor Graphics** Wilsonville, Ore.	435	435.2	23.6	5.4	4.7	7.2
103	106	**Diebold** Canton, Ohio	428	476.1	37.5	7.9	5.2	7.2
104	107	**Everex Systems** Fremont, Calif.	428	427.6	-0.8	-0.2	10.9	17.5
105	—	**ESCO Electronics** St. Louis	425	531.9	-2.5	-0.5	-0.3	-0.5
106	90	**Dover** New York	425	2,210.3	155.7	7.0	10.6	19.8
107	114	**Tandon** Moorpark, Calif.	422	421.8	25.6	6.1	10.1	25.2
108	110	**Premier Industrial** Cleveland	416	639.4	76.6	12.0	23.3	29.7
109	100	**Atari** Sunnyvale, Calif.	411	411.5	-20.8	-5.1	-7.6	-20.6
110	117	**Mark IV Industries** Amherst, N.Y.	410	872.2	24.3	2.8	3.2	16.4
111	128	**Anthem Electronics** San Jose	408	408.2	23.2	5.7	15.9	19.2
112	130	**Applied Magnetics** Goleta, Calif.	404	404.0	9.1	2.3	-3.1	-6.0
113	123	**Stratus Computer** Marlborough, Mass.	404	403.9	37.0	9.2	11.5	16.1
114	119	**Polaroid** Cambridge, Mass.	400	1,971.7	151.0	7.7	8.9	27.1
115	98	**M/A-Com** Burlington, Mass.	382	382.4	15.9	4.2	-8.6	-29.8
116	112	**MAI Systems** Tustin, Calif.	382	382.0	-79.9	-20.9	-16.3	-162.7
117	132	**Micropolis** Chatsworth, Calif.	381	380.6	7.9	2.1	3.6	9.9
118	125	**Andrew** Orlando Park, Ill.	380	379.9	18.5	4.9	5.7	9.1
119	127	**Wyle Laboratories** El Segundo, Calif.	359	449.5	12.7	2.8	6.5	12.0
120	106	**Micron Technology** Boise, Idaho	347	347.1	-4.4	-1.3	0.7	1.0
121	131	**Pioneer-Standard** Cleveland	342	342.4	8.1	2.4	4.0	12.8
122	186	**Archive** Costa Mesa, Calif.	332	332.3	8.8	2.7	3.6	11.5
123	101	**Smith Corona** New Canaan, Conn.	328	415.7	18.1	4.4	15.1	50.0
124	138	**VLSI Technology** San Jose	325	324.8	-12.7	-3.9	-3.9	-8.7
125	126	**Cubic** San Diego	316	343.8	22.2	6.4	8.4	16.1
126	121	**Sprague Technologies** Stamford, Conn.	315	314.6	2.2	0.7	0.7	1.3
127	146	**Inmac** Santa Clara, Calif.	307	307.2	3.8	1.2	3.1	8.4
128	136	**Sequa** New York	305	2,211.0	32.7	1.5	1.3	4.6
129	129	**Watkins-Johnson** Palo Alto, Calif.	303	311.9	13.0	4.2	5.8	9.1
130	140	**Savin** Stamford, Conn.	302	377.7	0.3	0.1	0.0	1.9
131	135	**Imo Industries** Lawrenceville, N.J.	300	1,018.1	21.2	2.1	1.9	6.3
132	118	**LTV** Dallas	300	6,138.3	70.9	1.2	1.1	-1.5
133	133	**Augat** Mansfield, Mass.	299	299.2	1.1	0.4	6.3	8.2
134	120	**Concurrent Computer** Tinton Falls, N.J.	296	296.2	-59.8	-20.2	-13.9	NM
135	137	**Textron** Providence	290	7,917.5	283.0	3.6	1.9	10.6
136	157	**Sundstrand** Rockford, Ill.	290	1,599.8	115.6	7.2	7.3	18.5
137	167	**QMS** Mobile, Ala.	286	286.3	15.1	5.3	8.6	18.7
138	—	**Acuson** Mountain View, Calif.	283	282.8	47.8	16.9	19.2	23.9
139	166	**Thomas & Betts** Bridgewater, N.J.	282	599.0	48.4	8.1	8.3	13.8
140	139	**Executone** Darien, Conn.	281	280.5	1.3	0.5	15.0	2.5
141	149	**Audiovox** Hauppauge, N.Y.	280	308.1	-3.2	-1.0	-2.2	-5.2
142	156	**Olin** Stamford, Conn.	280	2,592.0	84.0	3.2	4.5	11.7
143	134	**Gerber Scientific** South Windsor, Conn.	280	279.8	15.1	5.4	11.7	15.8
144	155	**Tyco Laboratories** Exeter, N.H.	280	2,576.0	125.2	4.9	8.4	19.6
145	173	**ADC Telecommunications** Minneapolis	271	270.7	23.8	8.8	12.6	17.1
146	144	**Bally Manufacturing** Chicago	270	2,082.2	-292.3	-14.0	-10.1	-87.9
147	150	**Chips and Technologies** San Jose	269	268.7	11.8	4.4	14.5	21.9
148	142	**Datapoint** San Antonio	268	267.5	-63.2	-23.6	-36.0	-137.7
149	185	**Diasonics** Milpitas, Calif.	267	267.1	16.4	6.1	5.9	11.3
150	145	**Bolt Beranek and Newman** Cambridge, Mass.	266	266.4	-22.2	-8.3	-18.7	-80.6

NA = not available
NM = not meaningful

* compounded average annual growth rate
** See "Notes to the ELECTRONIC BUSINESS 200" on page 67.

Return on investment	Cost of goods % of sales	R & D % of sales	Sales/ employee ($thousands)	Profits/ employee ($thousands)	Five-year growth (CAAGR)* sales	profits	Capital outlays to net cash flow after dividends	Debt to capital	Foreign sales % of sales	Fiscal year ended	Industry segment codes**
8.8%	46.4%	10.4%	$215.0	$10.5	47.7%	29.9%	59.9%	0.7%	40.3%	5/90	2
6.1	34.8	17.1	158.5	8.6	26.1	24.2	82.2	16.0	48.4	12/90	16
7.1	67.4	4.3	124.8	7.1	2.9	-2.3	112.0	1.2	19.2	12/90	1
16.0	69.9	6.4	175.7	9.8	87.6	93.4	30.4	8.5	12.8	7/90	5, 14
-0.4	75.5	0.0	86.8	-0.4	1.3	NM	-3,381.8	4.9	18.3	9/90	8
14.2	65.1	2.8	108.0	7.6	9.0	9.3	28.1	28.0	34.4	12/90	—
17.8	68.4	2.7	365.2	22.1	38.2	NM	26.2	29.4	95.8	12/90	5
29.0	50.4	0.5	133.2	15.9	7.7	14.2	24.1	2.5	0.0	5/90	6
-11.7	76.6	5.6	326.6	-16.5	23.7	NM	-25.1	43.3	88.7	12/90	4
3.8	60.6	2.5	91.5	3.0	84.8	57.7	44.4	76.8	12.5	2/90	—
19.2	76.5	0.0	701.3	39.9	27.8	30.7	27.1	0.0	0.0	12/90	6
-3.9	72.7	8.5	31.5	-0.9	25.0	NM	260.7	35.6	49.2	9/90	3
14.8	35.4	14.2	169.6	15.5	38.2	33.8	45.8	8.0	45.8	12/90	12
11.5	46.9	7.2	167.5	12.8	20.4	NM	65.0	57.8	46.3	12/90	—
-16.3	65.8	3.4	78.7	-6.6	-2.3	NM	-187.1	45.5	23.8	9/90	8
-26.3	50.0	2.8	105.2	-17.4	NA	NA	-24.3	83.8	59.7	9/90	16
4.9	77.0	5.3	126.0	2.6	32.0	23.3	28.4	50.2	68.5	12/90	14
6.8	56.9	6.2	114.4	5.7	11.2	5.2	70.7	25.2	55.2	9/90	2
8.9	75.2	0.0	214.4	6.1	11.5	53.0	30.0	25.7	0.0	1/91	6
0.8	53.3	10.7	92.6	1.4	34.4	99.8	95.9	16.9	22.7	8/90	15
5.8	76.4	0.0	371.1	6.7	8.2	12.6	131.2	54.6	0.0	3/90	6
4.8	59.2	7.6	87.1	3.4	38.4	62.0	76.9	58.4	27.7	9/90	14
24.4	71.6	2.0	131.0	9.3	13.8	NA	24.5	51.3	34.6	6/90	13
-4.7	47.0	16.5	155.6	-6.1	32.8	NM	97.7	45.8	44.5	12/90	15
11.3	68.5	1.0	110.2	7.2	2.4	10.3	8.0	29.3	0.0	9/90	8, 7
1.0	75.8	1.0	78.4	0.5	-4.0	NM	75.0	18.5	46.1	12/90	3
5.0	64.8	0.0	203.1	2.5	25.3	11.8	65.0	40.4	58.5	7/90	0
1.8	72.3	1.0	119.5	1.8	46.6	22.6	136.8	61.1	31.2	12/90	—
7.9	61.3	7.9	98.1	4.1	6.0	-6.7	74.1	12.3	32.1	12/90	8
0.2	62.5	0.0	185.8	0.1	-1.0	NM	144.1	89.1	15.4	12/90	13
2.6	69.9	1.5	111.9	2.3	21.5	20.0	68.3	59.5	36.8	12/90	3
-1.5	86.3	0.4	173.9	2.0	-5.6	NM	129.9	0.0	0.0	12/90	—
7.5	65.6	4.5	110.8	6.3	3.2	7.3	68.4	8.4	27.1	12/90	3
1.9	41.0	12.7	123.7	-15.1	49.7	NM	8,899.4	NM	43.5	6/90	12
2.9	52.4	2.5	146.6	5.2	16.2	11.1	461.2	73.1	13.6	12/90	—
11.6	59.2	7.8	123.1	8.9	4.5	9.2	61.9	37.2	7.6	12/90	—
11.5	59.9	3.1	200.5	10.6	33.0	22.9	36.5	38.4	38.0	9/90	14
23.9	36.2	9.5	231.2	39.1	NA	NA	30.3	0.0	21.8	12/90	11
10.2	52.4	3.1	122.3	9.9	11.5	7.2	99.3	26.1	44.8	12/90	—
1.1	59.7	2.5	122.0	0.5	NA	NA	17.4	58.1	0.0	12/90	2
-2.7	81.0	0.0	446.6	-4.6	14.3	NM	-288.8	47.3	0.0	11/90	4
6.5	74.8	2.5	170.5	5.5	8.0	NM	118.4	44.4	15.9	12/90	—
14.7	46.0	6.7	144.2	15.2	6.5	5.3	18.0	7.2	50.0	4/90	1
12.0	73.5	0.4	146.0	8.3	27.6	26.9	33.6	39.1	0.0	5/90	—
16.3	46.0	9.8	123.1	10.8	15.8	23.8	36.9	4.4	16.0	10/90	2
-25.9	61.7	0.9	79.6	-11.2	16.7	NM	-122.7	70.5	0.0	12/90	—
19.9	51.7	15.5	441.2	44.1	NA	NA	35.0	9.2	0.0	6/90	15
-58.8	54.6	3.2	147.7	-49.1	-12.5	NM	-21.8	57.3	91.2	7/90	2
9.2	58.5	6.2	175.7	10.8	19.0	42.0	50.8	19.1	54.4	12/90	11
-26.5	55.8	12.1	113.9	-15.1	13.6	NM	-80.7	67.2	14.6	6/90	8

(continued)

THE ELECTRONIC BUSINESS 200

FINANCIAL TABLES 150-200

Rank 1990	Rank 1989	Company Location	Calendar year 1990: Electronics sales ($ milions)	Total sales ($ milions)	Net profits ($ milions)	Profits % of sales	Fiscal year 1990: Return on assets	Return on equity
151	141	**Measurex** Cupertino, Calif.	$266	$266.2	$22.5	8.5%	6.7%	9.4%
152	143	**Ball** Muncie, Ind.	265	1,357.2	50.2	3.7	3.8	12.4
153	—	**Millipore** Bedford, Mass.	260	703.2	27.8	4.0	3.8	6.4
154	158	**Reynolds and Reynolds** Dayton, Ohio	257	607.3	22.7	3.7	4.7	10.4
155	154	**Logicon** Torrance, Calif.	257	256.5	8.6	3.3	8.4	12.0
156	153	**Genicom** Waynesboro, Va.	255	255.3	1.1	0.4	0.7	2.6
157	147	**Figgie International** Willoughby, Ohio	253	1,361.0	39.7	2.9	3.7	11.3
158	151	**CTS** Elkhart, Ind.	251	251.0	7.3	2.9	4.3	6.0
159	171	**Pittway** Northbrook, Ill.	250	944.1	24.1	2.5	3.2	6.2
160	—	**Thermo Electron** Waltham, Mass.	250	708.0	33.9	4.8	3.8	11.0
161	172	**AM International** Chicago	250	889.0	-39.5	-4.4	-6.1	-22.6
162	187	**Ask Computer Systems** Mountain View, Calif.	250	249.7	4.7	1.9	3.0	4.4
163	—	**Sequent Computer Systems** Beaverton, Ore.	249	248.8	18.8	7.6	7.5	9.7
164	175	**International Rectifier** El Segundo, Calif.	248	247.7	10.6	4.3	1.0	10.0
165	163	**Square D** Palatine, Ill.	246	1,653.3	116.6	7.1	8.0	19.2
166	180	**Ametek** Paoli, Pa.	245	660.7	37.3	5.7	6.1	18.7
167	162	**Bell Industries** Los Angeles	245	399.6	7.6	1.9	4.7	8.6
168	189	**Sun Electric** Crystal Lake, Ill.	242	242.0	3.3	1.4	1.8	3.2
169	152	**Cooper Industries** Houston	240	6,222.2	361.4	5.8	5.0	11.8
170	165	**Esterline** Bellevue, Wash.	239	373.0	6.0	1.6	2.4	9.9
171	—	**Autodesk** Sausalito, Calif.	238	237.9	56.8	23.9	21.4	26.0
172	193	**Teradata** El Segundo, Calif.	238	237.8	5.1	2.2	7.5	11.6
173	164	**Cincinnati Milacron** Cincinnati	235	837.7	-22.1	-2.6	-3.2	-8.9
174	161	**Fluke** Everett, Wash.	233	233.4	11.2	4.8	8.0	10.3
175	170	**Symbol Technologies** Bohemia, N.Y.	231	231.5	7.6	3.3	2.4	3.3
176	—	**Cadence Design Systems** San Jose	231	231.4	38.0	16.4	16.3	24.0
177	148	**Ashton-Tate** Torrance, Calif.	231	230.5	-18.1	-7.8	-7.4	-10.7
178	183	**Becton Dickinson** Franklin Lakes, N.J.	230	2,066.1	184.0	8.9	7.0	14.8
179	—	**Allen Group** Melville, N.Y.	227	352.3	-1.3	-0.4	-0.4	-1.0
180	181	**Cypress Semiconductor** San Jose	225	225.2	33.2	14.8	10.7	13.7
181	—	**Qume** Milpitas, Calif.	219	219.5	-15.2	-6.9	8.6	19.5
182	—	**Hubbell** Orange, Conn.	218	719.5	86.0	12.0	13.8	18.4
183	168	**Anacomp** Indianapolis	217	662.1	2.3	0.3	0.8	-16.0
184	—	**Solectron** San Jose	216	216.1	7.8	3.6	8.3	20.6
185	—	**Encore Computer** Ft. Lauderdale, Fla.	215	215.2	-30.1	-14.0	-18.6	NM
186	177	**Kollmorgen** Simsbury, Conn.	215	238.5	3.9	1.7	1.9	4.7
187	196	**Sensormatic Electronics** Deerfield Beach, Fla.	213	212.6	21.9	10.3	7.6	10.0
188	191	**Tellabs** Lisle, Ill.	211	211.0	8.1	3.8	4.7	6.2
189	159	**Recognition Equipment** Irving, Tex.	210	210.0	-24.4	-11.6	-17.5	-80.2
190	—	**Convex Computer** Richardson, Tex.	209	209.3	18.4	8.8	6.9	12.9
191	—	**Silicon Valley Group** San Jose	207	207.1	2.1	1.0	2.4	6.3
192	—	**Northgate Computer** Eden Prairie, Minn.	203	203.4	-6.9	-3.4	-14.1	NM
193	—	**Pyramid Technology** Mountain View, Calif.	200	200.5	18.4	9.2	8.7	10.9
194	179	**General DataComm** Middlebury, Conn.	199	199.4	-0.3	-0.2	0.3	0.7
195	178	**Integrated Device Technology** Santa Clara, Calif.	199	198.9	3.8	1.9	6.5	13.0
196	—	**Morton International** Chicago	198	1,798.9	139.2	7.7	7.4	13.4
197	176	**Ultimate** East Hanover, N.J.	197	196.9	-39.8	-20.2	0.1	0.1
198	182	**Coherent** Palo Alto, Calif.	194	193.8	-1.2	-0.6	-0.3	-0.5
199	—	**Borland International** Scotts Valley, Calif.	191	190.8	22.6	11.8	13.6	21.9
200	190	**BancTec** Dallas	190	189.8	11.7	6.2	6.7	15.0

NA = not available
NM = not meaningful

* compounded average annual growth rate
** See "Notes to the ELECTRONIC BUSINESS 200" on page 67.

Return on investment	Cost of goods % of sales	R & D % of sales	Sales/ employee ($thousands)	Profits/ employee ($thousands)	Five-year growth (CAAGR)* sales	profits	Capital outlays to net cash flow after dividends	Debt to capital	Foreign sales % of sales	Fiscal year ended	Industry segment codes**
9.2%	56.7%	7.6%	$103.2	$8.7	8.6%	4.9%	62.0%	2.1%	64.1%	11/90	1
5.6	81.9	0.9	108.5	4.0	3.8	-0.7	45.9	54.7	0.0	12/90	—
4.6	40.3	8.7	114.7	4.5	13.9	-2.6	152.4	27.7	56.7	12/90	9
6.4	54.1	1.7	117.0	4.8	12.3	3.0	44.3	38.5	10.9	9/90	—
12.0	79.6	0.9	84.5	2.8	8.8	0.9	30.3	0.0	0.0	3/90	8
0.9	69.2	3.4	88.2	0.4	15.1	-9.4	38.8	67.4	35.2	12/90	14
5.0	71.1	1.1	85.1	2.5	10.6	10.1	117.2	55.3	0.0	12/90	—
5.2	75.3	0.0	45.3	1.3	-0.8	-1.5	71.5	12.7	25.3	12/90	3
4.5	58.6	2.1	111.1	2.8	11.8	-5.0	201.2	28.0	25.9	12/90	—
6.4	62.5	7.4	116.8	5.6	28.1	28.6	46.4	41.8	35.4	12/90	—
-11.6	68.0	2.9	117.9	-5.6	11.6	NM	-42.7	48.5	46.2	7/90	—
4.3	46.7	8.0	220.0	5.3	21.2	-9.0	21.4	2.0	16.6	6/90	16
8.9	34.4	10.4	146.3	11.1	124.9	NM	130.6	7.7	30.8	12/90	10
1.3	65.9	2.9	88.5	0.8	11.1	-21.5	39.2	87.2	58.0	6/90	15
11.8	62.3	2.8	85.7	6.0	6.2	2.7	71.7	38.7	19.4	12/90	—
8.3	70.4	1.7	108.3	6.1	15.2	6.7	83.6	55.4	16.9	12/90	—
6.7	73.7	0.0	226.2	4.7	5.4	4.0	1,675.6	22.9	0.0	6/90	6
2.4	53.7	2.6	100.7	1.4	8.1	NM	62.6	23.9	43.7	12/90	9
7.2	63.5	0.0	108.2	6.3	15.2	21.7	62.2	39.2	32.4	12/90	—
3.2	57.4	4.4	100.6	1.8	8.9	39.8	54.0	67.9	34.9	10/90	9
26.0	5.9	10.3	215.8	51.5	51.8	54.1	34.8	0.0	55.5	1/91	16
10.1	32.2	13.0	143.4	12.0	139.8	NM	103.7	13.1	24.4	6/90	10
-5.3	74.5	4.1	113.0	-3.0	4.6	NM	-196.6	40.6	32.8	12/90	—
10.2	47.5	8.5	107.2	5.6	1.5	-4.3	56.2	1.1	35.7	9/90	9
3.0	43.8	3.8	120.8	4.0	75.4	95.5	88.3	9.9	63.3	12/90	1
22.0	9.2	18.4	138.1	22.7	70.4	NM	38.2	8.4	48.5	12/90	16
-10.3	13.8	17.2	142.3	-11.2	13.7	NM	90.3	3.6	62.5	12/90	16
8.9	47.5	5.1	108.8	9.9	14.0	17.7	95.7	39.8	41.5	9/90	—
-0.5	61.2	0.3	125.8	-0.5	2.4	NM	460.3	48.3	14.0	12/90	9
13.2	26.8	24.7	141.2	20.8	66.9	NM	54.8	3.8	22.0	12/90	15
14.0	76.4	3.7	194.6	9.3	33.1	NM	46.8	28.3	44.9	2/90	14
18.0	65.3	0.0	129.7	15.5	6.7	12.5	42.3	1.7	9.5	12/90	—
1.1	55.3	0.6	130.4	1.1	42.0	6.3	39.6	106.8	28.1	9/90	—
13.8	80.2	0.8	102.4	3.7	25.0	47.1	36.1	33.0	0.0	8/90	—
-25.6	49.0	14.8	128.2	-18.0	237.6	NM	-97.5	120.1	38.7	12/90	12
2.7	62.1	4.4	95.4	1.6	6.5	NM	72.6	42.8	42.8	12/90	—
9.1	35.8	2.9	133.6	14.0	18.3	21.8	29.1	9.1	36.0	5/90	1
6.0	51.1	15.0	103.5	4.0	16.1	3.1	80.4	3.5	30.3	12/90	2
-25.6	64.8	4.3	152.2	-20.9	7.2	NM	-19.4	68.1	57.9	10/90	1
8.7	35.0	13.0	172.3	15.2	73.0	NM	76.7	32.5	40.4	12/90	10
4.4	57.5	13.7	109.0	2.6	38.0	-4.9	88.1	30.6	36.1	9/90	—
-57.9	73.3	0.5	291.8	-9.9	NA	NA	-58.6	126.6	3.0	12/90	5
10.8	37.6	11.3	149.8	14.0	39.6	41.4	79.0	0.7	40.1	9/90	10
0.5	45.4	10.4	98.7	0.2	1.1	-47.7	32.5	35.0	35.0	9/90	2
8.1	35.0	19.9	100.2	8.1	40.4	-64.5	83.7	37.6	24.0	3/90	15
10.0	63.8	2.9	168.9	13.9	NA	NA	65.2	25.3	30.4	6/90	—
0.1	56.7	2.8	287.3	0.2	14.8	-60.1	140.5	16.1	33.1	4/90	16
-0.4	55.8	11.5	125.9	-0.3	7.7	NA	96.0	14.7	46.4	9/90	9
18.3	16.5	12.6	194.3	20.2	57.8	66.0	15.7	16.1	33.9	3/90	16
9.1	65.5	6.1	104.0	5.9	22.0	NA	52.8	39.2	16.0	3/90	1

THE ELECTRONIC BUSINESS 200

INDUSTRY SEGMENTS

Fiscal year 1990

Company 200 rank	Sales/employee ($thousands)	rank	Cost of goods % of sales	rank	R&D % of sales	rank	Capital expenditures % of sales	rank	Foreign sales % of sales	rank
◀ Industry segment code										
1 COMPUTER-BASED SYSTEMS										
BancTec 200	**$104.0**	7	**65.5%**	2	**6.1%**	4	**5.9%**	3	**16.6%**	8
Diebold 103	**124.8**	5	**67.4**	1	**4.3**	5	**4.7**	5	**19.2**	7
Gerber Scientific 143	**144.2**	2	**46.0**	6	**6.7**	3	**2.3**	7	**50.0**	5
Hewlett-Packard 4	**143.8**	3	**48.6**	5	**10.3**	1	**7.2**	1	**54.4**	4
Measurex 151	**103.2**	8	**56.7**	4	**7.6**	2	**5.8**	4	**64.1**	1
Recognition Equipment 189	**152.2**	1	**64.8**	3	**4.3**	5	**1.4**	8	**57.9**	3
Sensormatic Electronics 187	**133.6**	4	**35.8**	8	**2.9**	8	**4.2**	6	**38.0**	6
Symbol Technologies 175	**120.8**	6	**43.8**	7	**3.8**	7	**6.6**	2	**63.3**	2
Weighted average	$141.1		49.5%		9.7%		6.9%		52.9%	
◀ Industry segment code										
2 COMMUNICATIONS										
3Com 101	**$215.0**	1	**46.4%**	8	**10.4%**	2	**6.1%**	5	**40.3%**	4
ADC Telecommunications 145	**123.1**	6	**46.0**	9	**9.8**	5	**5.3**	6	**16.0**	9
Andrew 118	**114.4**	8	**56.9**	3	**6.2**	9	**6.9**	3	**55.2**	2
Datapoint 148	**147.7**	3	**54.6**	6	**3.2**	10	**5.1**	7	**91.2**	1
DSC Communications 90	**128.4**	5	**55.8**	5	**10.0**	4	**13.1**	1	**10.8**	10
Dynatech 95	**144.7**	4	**44.4**	11	**9.8**	5	**3.5**	9	**26.7**	7
Executone Information Systems 140	**122.0**	7	**59.7**	2	**2.5**	11	**0.6**	11	**0.0**	11
General DataComm Industries 194	**98.7**	11	**45.4**	10	**10.4**	2	**2.5**	10	**35.0**	5
Motorola 7	**103.7**	9	**56.0**	4	**9.3**	7	**11.5**	2	**54.2**	3
Scientific-Atlanta 83	**170.6**	2	**63.9**	1	**6.5**	8	**4.5**	8	**19.0**	8
Tellabs 188	**103.5**	10	**51.1**	7	**15.0**	1	**6.3**	4	**38.3**	6
Weighted average	$110.3		55.3%		9.0%		10.1%		48.2%	
◀ Industry segment code										
3 COMPONENTS										
AMP 33	**$123.2**	1	**59.0%**	7	**3.6%**	1	**11.1%**	2	**59.3%**	2
Applied Magnetics 112	**31.5**	8	**72.7**	3	**8.5**	2	**10.8**	3	**49.2**	3
Augat 133	**110.8**	3	**65.6**	5	**4.5**	4	**6.0**	5	**27.1**	7
CTS 158	**45.3**	7	**75.3**	2	**0.0**	8	**4.7**	7	**25.3**	8
Ims Industries 131	**111.9**	2	**69.9**	4	**1.5**	5	**3.3**	8	**36.8**	6
Molex 81	**88.4**	4	**47.7**	8	**5.5**	3	**12.2**	1	**71.1**	1
Sprague Technologies 126	**78.4**	5	**75.8**	1	**1.0**	7	**4.9**	6	**46.1**	4
Vishay Intertechnology 100	**53.6**	6	**62.9**	6	**1.5**	5	**6.8**	4	**45.0**	5
Weighted average	$86.9		62.5%		5.8%		8.8%		51.7%	
◀ Industry segment code										
4 CONSUMER										
Atari 109	**$326.6**	3	**76.6%**	4	**5.6%**	1	**1.0%**	4	**68.7%**	1
Audiovox 141	**446.6**	2	**81.0**	3	**0.0**	3	**1.3**	3	**0.0**	4
Emerson Radio 76	**800.2**	1	**89.6**	1	**0.0**	3	**.6**	5	**0.0**	4
Tandy 16	**115.4**	4	**50.9**	5	**0.6**	3	**2.5**	1	**6.7**	2
Zenith Electronics 48	**52.2**	5	**89.0**	2	**4.0**	2	**2.3**	2	**6.1**	3
Weighted average	$108.9		65.2%		1.0%		2.1%		10.0%	

Includes only companies with electronics sales over 50% of total

See "Notes to the ELECTRONIC BUSINESS 200" on page 67.

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THE ELECTRONIC BUSINESS 200

INDUSTRY SEGMENTS

Fiscal year 1990

Company 200 rank	Sales/employee ($thousands)	rank	Cost of goods % of sales	rank	R&D % of sales	rank	Capital expenditures % of sales	rank	Foreign sales % of sales	rank
5 DESKTOP COMPUTERS (Industry segment code)										
Apple Computer 13	$362.6	1	43.2%	9	8.6%	4	4.0%	5	41.7%	6
AST Research 82	230.9	6	85.4	4	3.5	8	2.1	7	34.4	7
Compaq Computer 20	315.7	3	53.4	6	5.2	6	9.0	1	53.9	3
Dell Computer 87	271.4	5	65.0	5	4.1	7	1.7	10	34.3	8
Everex Systems 104	175.7	9	89.9	2	6.4	5	2.2	6	12.8	9
Intergraph 63	198.8	10	45.9	8	10.5	3	7.6	3	47.2	4
Northgate Computer 192	291.8	4	73.3	1	0.5	10	2.1	7	3.0	10
Silicon Graphics 96	200.0	8	39.8	10	10.9	2	7.1	4	43.4	5
Sun Microsystems 30	214.6	7	48.8	7	12.2	1	8.6	2	57.1	2
Tandon 107	365.2	2	68.4	3	2.7	9	1.9	9	95.8	1
Weighted average	$263.6		50.0%		7.9%		6.0%		47.1%	
6 DISTRIBUTION (Industry segment code)										
Anthem Electronics 111	$701.3	1	76.5%	2	0.0%	—	1.7%	4	0.0%	—
Arrow Electronics 65	425.9	2	77.7	1	0.0	—	0.6	8	0.0	—
Avnet 46	233.5	5	73.3	7	0.0	—	1.0	6	0.0	—
Bell Industries 167	226.2	6	73.7	6	0.0	—	1.4	5	0.0	—
Marshall Industries 85	341.9	4	76.0	4	0.0	—	3.1	2	0.0	—
Pioneer-Standard 121	371.1	3	76.4	3	0.0	—	3.2	1	0.0	—
Premier Industrial 108	133.2	8	50.4	8	0.5	—	2.3	3	0.0	—
Wyle Laboratories 119	214.4	7	75.2	5	0.0	—	1.0	6	0.0	—
Weighted average	$255.9		72.3%		0.1%		1.5%		0.0%	
7 DIVERSIFIED (Industry segment code)										
Control Data 44	$116.6	4	59.7%	4	7.5%	4	2.3%	7	32.4%	5
Cubic 125	110.2	6	68.5	1	1.0	8	0.7	8	0.0	8
Harris 25	91.4	8	58.7	5	4.8	6	6.3	4	27.8	7
Hewlett-Packard 4	143.8	2	48.6	7	10.3	1	7.2	2	54.4	3
Honeywell 11	104.6	7	63.8	3	4.4	7	4.0	6	31.8	6
IBM 1	184.6	1	36.8	8	9.5	2	9.4	1	60.7	2
NCR 12	114.3	5	49.2	6	8.8	3	6.4	3	61.9	1
Varian Associates 53	124.0	3	65.7	2	6.1	5	4.3	5	41.5	4
Weighted average	$157.5		42.3%		8.9%		8.3%		56.2%	
8 GOVERNMENT (Industry segment code)										
Bolt Beranek and Newman 150	$113.9	3	55.8%	12	12.1%	1	4.3%	7	14.8%	10
Cubic 125	110.2	4	68.5	8	1.0	10	0.7	13	0.0	12
ESCO Electronics 105	86.8	10	75.5	4	0.0	12	3.3	10	18.3	7
E-Systems 45	98.2	7	82.8	1	0.0	12	3.3	10	7.2	11
GM Hughes Electronics 6	122.1	1	70.8	7	4.8	5	7.5	2	16.2	9
Harris 25	91.4	9	58.7	11	4.8	5	6.3	3	27.8	4
Litton Industries 24	101.9	5	73.7	5	3.2	8	3.7	9	26.5	5
Logicon 155	84.5	11	78.8	2	0.9	11	1.4	12	0.0	12
Loral 42	100.3	6	52.4	13	5.5	4	4.8	5	29.0	3
M/A-Com 115	78.7	12	65.8	9	3.4	7	4.7	6	23.8	6
Raytheon 14	120.8	2	76.5	3	2.9	9	4.2	8	17.4	8
Texas Instruments 10	93.4	9	72.9	6	8.2	2	13.8	1	33.2	1
Watkins-Johnson 129	98.1	8	61.3	10	7.3	3	5.4	4	32.1	2
Weighted average	$107.5		71.7%		4.5%		6.7%		21.3%	

(continued)

THE ELECTRONIC BUSINESS 200

INDUSTRY SEGMENTS

Fiscal year 1990

Company 200 rank	Sales/ employee ($thousands)	rank	Cost of goods % of sales	rank	R&D % of sales	rank	Capital expenditures % of sales	rank	Foreign sales % of sales	rank
9 INSTRUMENTS & MEASUREMENT (◀ Industry segment code)										
Allen Group 179	$125.8	3	61.2%	3	6.3%	11	1.9%	11	14.0%	11
Coherent 198	125.9	2	55.8	5	11.5	3	3.6	7	46.4	3
Esterline 170	100.6	11	57.4	4	4.4	8	3.4	8	34.9	9
Fluke 174	107.2	6	47.5	9	8.5	5	4.5	4	35.7	8
Honeywell 11	104.6	7	63.8	2	4.4	9	4.0	6	31.8	10
Millipore 153	114.7	5	40.3	11	8.7	4	9.7	1	56.7	1
Perkin-Elmer 78	130.0	1	49.0	8	7.6	6	1.7	11	53.0	2
Sun Electric 168	100.7	10	53.7	7	2.6	10	2.3	9	43.7	5
Tektronix 49	101.0	9	46.7	10	13.8	2	6.9	2	46.2	4
Teradyne 98	104.3	8	54.1	6	14.6	1	5.2	3	43.3	6
Varian Associates 53	124.0	4	65.7	1	6.1	7	4.3	5	41.5	7
Weighted average	$108.5		58.5%		6.5%		4.5%		37.8%	
10 MAINFRAMES (◀ Industry segment code)										
Amdahl 39	$241.2	1	50.6%	3	14.4%	2	14.1%	4	47.9%	4
Control Data 44	116.6	9	59.7	2	7.5	9	2.3	11	32.4	8
Convex Computer 190	172.3	3	35.0	7	13.0	3	12.0	5	40.4	6
Cray Research 71	165.6	4	23.2	10	16.9	1	7.8	7	40.7	5
IBM 1	184.6	2	36.8	6	9.5	7	9.4	6	60.7	2
NCR 12	114.3	10	49.2	4	8.8	8	6.4	8	61.9	1
Pyramid Technology 193	149.8	5	37.6	5	11.3	5	14.3	3	40.1	7
Sequent Computer Systems 163	146.3	6	34.4	8	10.4	6	19.0	1	30.8	9
Teradata 172	143.4	7	32.2	9	13.0	3	15.3	2	24.4	10
Unisys 8	134.3	8	60.0	1	7.4	10	4.6	9	51.8	3
Weighted average	$169.0		40.9%		9.3%		8.7%		58.5%	
11 MEDICAL (◀ Industry segment code)										
Acusen 138	$231.2	1	39.2%	4	9.5%	3	5.9%	3	21.8%	5
Beckman Instruments 69	115.6	5	42.8	3	9.9	2	8.3	1	54.9	1
Diasonics 149	175.7	2	58.5	1	6.2	5	4.5	4	54.4	2
Medtronic 70	123.5	4	27.8	5	9.5	3	6.6	2	39.6	3
Westmark International 94	133.6	3	49.7	2	11.8	1	3.9	5	31.5	4
Weighted average	$133.0		40.2%		9.7%		6.3%		42.4%	
12 MINICOMPUTERS (◀ Industry segment code)										
Concurrent Computer 134	$123.7	4	41.0%	5	12.7%	4	4.2%	7	43.5%	6
Data General 56	114.8	6	47.1	3	11.6	6	7.0	3	52.0	4
Digital Equipment 5	104.4	7	46.3	4	12.5	5	7.9	2	56.3	1
Encore Computer 185	126.2	3	49.0	1	14.8	1	4.9	6	36.7	7
Stratus Computer 113	169.6	2	35.4	6	14.2	2	6.8	4	45.8	5
Tandem Computers 41	170.6	1	28.9	7	13.6	3	16.1	1	55.6	2
Wang Laboratories 37	123.7	4	48.5	2	8.9	7	6.1	5	52.5	3
Weighted average	$112.9		44.7%		12.1%		6.3%		54.8%	
13 OFFICE EQUIPMENT (◀ Industry segment code)										
Pitney Bowes 38	$106.7	4	30.3%	4	3.4%	2	10.1%	1	23.4%	3
Savin 130	185.8	1	62.5	2	0.0	4	9.6	2	15.4	4
Smith Corona 123	131.0	3	71.6	1	2.0	3	1.7	4	34.6	2
Xerox 3	137.2	2	43.9	3	6.2	1	3.3	3	50.7	1
Weighted average	$131.0		42.6%		5.5%		4.6%		44.6%	

(continued)

THE ELECTRONIC BUSINESS 200

INDUSTRY SEGMENTS

Fiscal year 1990

Company 200 rank	Sales/ employee ($ thousands)	rank	Cost of goods % of sales	rank	R&D % of sales	rank	Capital expenditures % of sales	rank	Foreign sales % of sales	rank
14 PERIPHERALS (◀ industry segment code)										
Archive 122	$87.1	11	59.2%	11	7.8%	3	7.2%	3	27.7%	11
Conner Peripherals 51	148.8	5	72.9	4	4.7	8	7.1	4	49.8	2
Everex Systems 104	175.7	4	69.9	7	6.4	5	2.2	11	12.8	12
Genicom 156	88.2	10	69.2	9	3.4	11	2.2	11	35.2	8
Maxtor 73	104.4	9	72.1	5	7.2	4	9.1	1	33.9	9
Micropolis 117	126.8	7	77.9	1	5.3	7	2.3	10	68.5	1
OMS 137	208.5	2	59.9	10	3.1	12	3.3	8	38.9	6
Quantum 77	504.9	1	69.3	8	5.8	6	3.7	7	32.9	10
Qume 181	194.6	3	76.4	2	3.7	10	2.9	9	44.9	4
Seagate Technology 31	83.5	12	74.8	3	4.3	9	4.2	6	35.3	7
Storage Technology 58	125.3	8	58.1	12	6.6	1	5.2	5	42.1	5
Western Digital 60	140.7	6	71.1	6	7.7	2	5.1	2	45.6	3
Weighted average	$104.4		70.2%		5.8%		5.3%		39.6%	
15 SEMICONDUCTORS (◀ industry segment code)										
Advanced Micro Devices 61	$88.3	11	51.8%	7	19.2%	3	28.7%	1	35.7%	8
Analog Devices 91	85.1	12	40.7	11	16.6	4	7.9	11	53.9	3
Chips and Technologies 147	441.2	1	51.7	8	15.5	6	4.6	12	6.8	13
Cypress Semiconductor 180	141.2	5	26.8	13	24.7	1	16.2	5	22.8	12
Integrated Device Technology 195	100.2	7	35.9	12	19.9	2	16.7	4	24.9	10
Intel 18	164.1	2	41.3	10	13.2	8	17.3	3	48.9	4
International Rectifier 164	88.5	10	65.9	2	2.9	13	2.4	13	58.9	1
LSI Logic 80	149.8	4	58.4	4	9.2	11	8.5	10	43.8	7
Micron Technology 120	92.6	9	53.3	6	10.7	9	24.8	2	22.7	11
Motorola 7	103.7	6	56.9	5	9.3	10	11.5	7	54.2	2
National Semiconductor 43	51.2	13	64.8	3	15.1	7	10.9	8	45.4	5
Texas Instruments 10	93.4	8	72.9	1	8.2	12	13.8	6	33.2	9
VLSI Technology 124	155.6	3	47.8	9	16.5	5	16.9	8	44.5	6
Weighted average	$100.7		57.6%		10.8%		13.5%		44.7%	
16 SOFTWARE (◀ industry segment code)										
Ashton-Tate 177	$142.3	11	13.8%	8	17.2%	2	5.1%	9	82.5%	1
Ask Computer Systems 162	220.9	2	46.7	3	8.9	11	1.5	13	16.6	13
Autodesk 171	215.8	3	5.9	12	10.3	9	8.9	4	55.5	3
Borland International 199	194.3	7	16.5	7	12.6	7	2.5	10	33.9	11
Cadence Design Systems 176	138.1	12	9.2	11	18.4	1	9.6	2	48.5	6
Computer Associates 52	187.8	8	-8.5	13	13.2	6	1.8	12	48.0	8
Lotus Development 79	195.6	5	12.9	9	15.0	5	7.5	6	47.6	9
MAI Systems 116	105.2	13	50.8	2	2.8	12	2.4	11	59.7	2
Mentor Graphics 102	158.5	9	34.8	4	17.1	3	8.8	5	48.4	7
Microsoft 47	216.9	4	17.4	6	15.3	4	13.4	1	54.9	4
Novell 88	194.6	6	22.2	5	11.9	8	5.7	8	39.6	10
Oracle Systems 62	142.5	10	12.8	10	9.1	10	9.2	3	46.3	5
Ultimate 197	287.3	1	56.7	1	2.8	12	7.8	7	33.1	12
Weighted average	$173.7		15.8%		12.4%		7.1%		48.6%	

Includes only companies with electronics sales over 50% of total
See "Notes to the ELECTRONIC BUSINESS 200" on page 67.

Notes to the ELECTRONIC BUSINESS 200

Sales
Sales includes sales of products, services and rentals, but excludes dividends, interest and other non-operating revenue.

Profits
Profits is income from continuing operations after taxes and before extraordinary items or charges if any are shown on the income statement.

Debt to total capital
Debt to total capital includes long-term and short-term debt as a percentage of shareholders' equity plus long-term and short-term debt.

Return on equity
ROE is profits as a percentage of shareholders' equity (preferred stock, capital stock, surpluses and retained earnings) at the company's fiscal year end.

Capital expenditures
Capital expenditures (investment in property, plant, and equipment) are measured as a percentage of profits from continuing operations plus depreciation, minus cash dividends paid.

Return on investment
ROI is profits as a percentage of shareholders' equity, short-term and long-term debt. Short-term debt includes the current portion of long-term debt, notes payable, and other borrowings.

Cost of goods sold
COGS includes manufacturing cost of products, services, and rentals sold, minus depreciation as a percentage of total sales.

Research and development
R&D is company-sponsored research and development expenses as a percentage of total sales.

Employees
The number of employees is supplied by each company. In most cases this number represents year-end employment.

Return on assets
ROA is profits as a percentage of total assets at the company's fiscal year end.

Foreign sales
Foreign sales include U.S. operations' export sales and sales from operations outside the U.S. to unaffiliated customers.

Industry segment classification

Companies are classified in the industry segments that represents the greatest volume of their sales. For purposes of comparison, only companies with electronic sales comprising 50% or more of total sales are included in the industry segment weighted averages. (In previous years electronics sales of 70% or more of total sales were required.)

Comparisons of companies in like industry segments should be made with caution. For example, Wyle Laboratories Inc. is classified under distribution because 80% of its sales are in this category. The remaining 20% of sales are from service. However, sales per employee and other ratios are calculated from total company figures. A company like Wyle may find its productivity ranking for example, to be lower compared with other distributors that get 100% of sales from distribution. Comparisons between two years must also be made with caution as companies acquire or sell off divisions.

Industry segment codes

1 Computer-based systems
2 Communications
3 Components (other than semiconductors)
4 Consumer
5 Desktop computers
6 Distribution
7 Diversified
8 Government
9 Instruments & measurement
10 Mainframes
11 Medical
12 Minicomputers
13 Office equipment
14 Peripherals
15 Semiconductors
16 Software

Newcomers to the 200

Company	1990 Rank
Acuson	138
Allen Group	179
Autodesk	171
Borland International	199
Cadence Design Systems	176
Convex Computer	190
Encore Computer	185
ESCO Electronics [1]	105
Hubbell [2]	182
Millipore	153
Morton International	196
Northgate Computer	192
Pyramid Technology	193
Qume	181
Sequent Computer Systems	163
Silicon Valley Group	191
Solectron	184
Thermo Electron	160

1 spin-off by Emerson Electric Co., Oct. 1989
2 acquired Brand-Rex Telecom Division-Modular Products Group, July 1990

Displaced from the 200

Company	1989 Rank
Burr-Brown	197
Cipher Data Products [1]	184
Contel [2]	77
Dataproducts [3]	124
Digital Communications	174
Dynascan	160
Flextronics	192
Foxboro [4]	116
General Instrument [5]	49
GenRad	188
Hadco	200
Intermec	199
KLA Instruments	198
LPL Technologies [6]	76
Network Equipment	194
TIE/Communications	169
Valid Logic Systems	195
Wyse Technology [7]	91

1 acquired by Archive (#122) Apr. 1990
2 acquired by GTE Corp. (#34) Mar. 1991
3 acquired by Hitachi Koki and Nissei Sangyo May 1990
4 acquired by Siebe plc Sept. 1990
5 acquired by Ferstmann Little & Co. Aug. 1990
6 went private May 1990
7 acquired by Channel International Corp. of Taiwan Jan. 1990

THE ELECTRONIC BUSINESS 200

ALPHABETICAL INDEX

Company	200 Rank
3Com Corp.	101
3M Co.	21
Acuson Corp.	138
ADC Telecommunications Inc.	145
Advanced Micro Devices Inc.	61
Allen Group Inc., The	179
Allied-Signal Inc.	29
AM International Inc.	161
Amdahl Corp.	39
Ametek Inc.	166
AMP Inc.	33
Anacomp Inc.	183
Analog Devices Inc.	91
Andrew Corp.	118
Anthem Electronics Inc.	111
Apple Computer Inc.	13
Applied Magnetics Corp.	112
Applied Materials Inc.	84
Archive Corp.	122
Arrow Electronics Inc.	65
Ashton-Tate Corp.	177
Ask Computer Systems Inc.	162
AST Research Inc.	82
AT&T	2
Atari Corp.	109
Audiovox Corp.	141
Augat Inc.	133
Autodesk Inc.	171
Avnet Inc.	46
Ball Corp.	152
Bally Manufacturing Corp.	146
BancTec Inc.	200
Beckman Instruments Inc.	69
Becton, Dickinson and Co.	178
Bell Industries Inc.	167
Boeing Co., The	32
Bolt Beranek and Newman Inc.	150
Borland International Inc.	199
Cadence Design Systems Inc.	176
Chips and Technologies Inc.	147
Chrysler Corp.	55
Cincinnati Milacron Inc.	173
Coherent Inc.	198
Compaq Computer Corp.	20
Computer Associates International Inc.	52
Concurrent Computer Corp.	134
Conner Peripherals Inc.	51
Control Data Corp.	44
Convex Computer Corp.	190
Cooper Industries Inc.	169
Corning Inc.	74
Cray Research Inc.	71
CTS Corp.	158
Cubic Corp.	125
Cypress Semiconductor Corp.	180
Data General Corp.	56
Datapoint Corp.	148
Dell Computer Corp.	87
Diasonics Inc.	149
Diebold Inc.	103
Digital Equipment Corp.	5
Dover Corp.	106
DSC Communications Corp.	90
DuPont, De Nemours & Co., E.I.	35
Dynatech Corp.	95
Eastman Kodak Co.	17
Eaton Corp.	67
EG&G Inc.	75
Eli Lilly and Co.	89
Emerson Electric Co.	36
Emerson Radio Corp.	76
Encore Computer Corp.	185
ESCO Electronics Corp.	105
Esterline Corp.	170
Everex Systems Inc.	104
Executone Information Systems Inc.	140
E-Systems Inc.	45
Figgie International Inc.	157
Fluke Mfg. Co., John	174
Ford Motor Co.	22
General DataComm Industries Inc.	194
General Dynamics Corp.	59
General Electric Co.	9
General Signal Corp.	72
Genicom Corp.	156
Gerber Scientific Inc.	143
GM Hughes Electronics Corp.	6
Grumman Corp.	64
GTE Corp.	34
Harris Corp.	25
Hewlett-Packard Co.	4
Honeywell Inc.	11
Hubbell Inc.	182
IBM	1
Imo Industries Inc.	131
Inmac Corp.	127
Integrated Device Technology Inc.	195
Intel Corp.	18
Intergraph Corp.	63
International Rectifier Corp.	164
ITT Corp.	28
Johnson Controls Inc.	50
Kollmorgen Corp.	186
Litton Industries Inc.	24
Lockheed Corp.	19
Logicon Inc.	155
Loral Corp.	42
Lotus Development Corp.	79
LSI Logic Corp.	80
LTV Corp., The	132
MAI Systems Corp.	116
Mark IV Industries Inc.	110
Marshall Industries	85
Martin Marietta Corp.	26
Maxtor Corp.	73
McDonnell Douglas Corp.	40
Measurex Corp.	151
Medtronic Inc.	70
Mentor Graphics Corp.	102
Micron Technology Inc.	120
Micropolis Corp.	117
Microsoft Corp.	47
Millipore Corp.	153
Molex Inc.	81
Monsanto Co.	97
Morton International Inc.	196
Motorola Inc.	7
M/A-Com Inc.	115
National Semiconductor Corp.	43
NCR Corp.	12
Northgate Computer Corp.	192
Northrop Corp.	68
Novell Inc.	88
Olin Corp.	142
Oracle Systems Corp.	62
Penn Central Corp.	93
Perkin-Elmer Corp., The	78
Pioneer-Standard Electronics Inc.	121
Pitney Bowes Inc.	38
Pittway Corp.	159
Polaroid Corp.	114
Premier Industrial Corp.	108
Pyramid Technology Corp.	193
QMS Inc.	137
Quantum Corp.	77
Qume Corp.	181
Raychem Corp.	86
Raytheon Co.	14
Recognition Equipment Inc.	189
Reliance Electric Co.	92
Reynolds and Reynolds Co., The	154
Rockwell International Corp.	15
Savin Corp.	130
SCI Systems Inc.	57
Scientific-Atlanta Inc.	83
Seagate Technology Inc.	31
Sensormatic Electronics Corp.	187
Sequa Inc.	128
Sequent Computer Systems Inc.	163
Silicon Graphics Inc.	96
Silicon Valley Group Inc.	191
Smith Corona Corp.	123
Solectron Corp.	184
Sprague Technologies Inc.	126
Square D Co.	165
Storage Technology Corp.	58
Stratus Computer Inc.	113
Sun Electric Corp.	168
Sun Microsystems Inc.	30
Sundstrand Corp.	136
Symbol Technologies Inc.	175
Tandem Computers Inc.	41
Tandon Corp.	107
Tandy Corp.	16
Tektronix Inc.	49
Teledyne Inc.	66
Tellabs Inc.	188
Teradata Corp.	172
Teradyne Inc.	98
Texas Instruments Inc.	10
Textron Inc.	135
Thermo Electron Corp.	160
Thomas & Betts Corp.	139
TRW Inc.	27
Tyco Laboratories Inc.	144
Ultimate Corp., The	197
Unisys Corp.	8
United Technologies Corp.	54
United Telecommunications Inc.	99
Varian Associates Inc.	53
Vishay Intertechnology Inc.	100
VLSI Technology Inc.	124
Wang Laboratories Inc.	37
Watkins-Johnson Co.	129
Western Digital Corp.	60
Westinghouse Electric Corp.	23
Westmark International Inc.	94
Wyle Laboratories Inc.	119
Xerox Corp.	3
Zenith Electronics Corp.	48

Overall profits continue three-year slide

Software companies dominate the earnings scene, joined by a mix of semiconductor, computer, and medical equipment manufacturers

By Dwight B. Davis

Not since 1985 have the top 200 U.S. electronics companies had such a tough time making money as in 1990. Amid war jitters and a faltering U.S. economy, 38 companies saw red ink last year, and the ELECTRONIC BUSINESS 200's average profits dropped to 4.38%—down from 4.83% in 1989 and 5.13% in 1988.

The recession that plagued many electronics manufacturers in late 1990 continues to dull overall earnings into 1991. But some economists expect a broad-based industrial upswing this year. "We're projecting a midyear upturn out of the recession, with 2% to 3% growth in the second half," says John Ryding, senior economist at Bear, Stearns & Co. in New York. Already aiding profits this year are lower interest rates, which will help companies keep their interest costs under control. Ryding predicts earnings of $23.25 per share for the Standard & Poor 500 in 1991, up 8.8% from last year's $21.37 per-share earnings.

As usual, the software sector of the ELECTRONIC BUSINESS 200 performed well despite war, recession, and interest rates, and set the pace for profitability in 1990. The top 3 companies in the profitability ranking—and 6 of the top 15—are software producers. Nevertheless, the sector was by no means invulnerable: Both Ashton-Tate Corp. and The Ultimate Corp. lost millions last year.

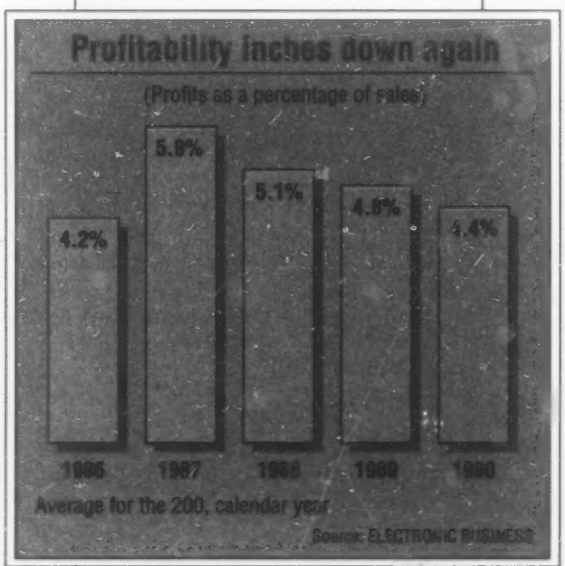
Leading the 1990 list is Microsoft Corp. of Redmond, Wash., whose calendar year profits totaled $355.6 million on sales of $1.48 billion, or 24.1% of sales. Microsoft finally achieved the top ranking after placing third in 1988 and second in 1989. Autodesk Inc. of Sausalito, Calif., and Novell Inc. of Provo, Utah, placed second and third, respectively.

Software vendors have one built-in advantage over hardware manufacturers: With minuscule raw material costs and the ability to replicate their products inexpensively, the software companies can keep cost of sales down and gross profit margins flying. Microsoft's performance in the first quarter of 1991 (the company's third fiscal quarter) is indicative: On revenue of $486.9 million, the company realized a net income of $123.8 million, or 25.4%. Cost of sales was just 19.6% of revenue for the quarter, resulting in a gross profit margin of 80.4%.

"It's tough to hold those margin levels, and we don't predict we'll be able to maintain them," says Buck Ferguson, director of administration and investor relations at Microsoft. However he does expect the company's overall profitability to hold steady in the coming years.

For its part, Novell saw its gross profit margins grow from 71% in early 1990 to 82% a year later. But further improvements may be elusive. "We're approaching the ceiling at 82%," says James R. Tolonen, Novell's chief financial officer.

Despite their cost-of-sales advantage, software companies often incur greater operating expenses than their hardware brethren, Tolonen notes. Distribution costs can be relatively high for software producers, as can research and development expenditures. At Autodesk, operating profit margins have dropped from about 40% of revenue to the 32% to 33% range, largely because the company has been pumping more money into R&D, according to Christine Tsingos, Autodesk's treasurer. That expense will grow slightly this



year, she says, from about 11% of revenue to 12% by year end.

Compaq Computer Corp., by contrast, spent just 5.2% of its revenue on R&D last year. "Because we're part of an industry standard in personal computers, we can leverage Intel's and Microsoft's R&D," explains Daryl J. White, senior vice president of finance and chief financial officer at the Houston company. Thanks to material cost reductions during 1990 (especially in memory chips), Compaq raised its gross profit margin to a healthy 42.8%—slightly more than half that of the software leaders.

ALTHOUGH 1990 WAS a strong year for Compaq, with after-tax earnings 12.6% of sales, 1991 looks less promising. Like other PC manufacturers, Compaq saw earnings decline due to a combination of factors. The strong dollar, for example, hurt foreign sales, and aggressive price cutting made profits harder to come by. In addition, Compaq announced in May that dealer channel restructuring had caused an inventory glut and a consequent drop in new orders.

To counter the strong dollar, Compaq will increase the local content of parts for its PCs built in Scotland. "Materials make up 80% of the cost of goods sold," notes White. He also expects the excess inventory to be corrected by this year's fourth quarter and says the company should still see 3% after-tax earnings for the year.

Last year was not a good one for the overall semiconductor industry, yet two of its San Jose-based members—Intel Corp. and Cypress Semiconductor Corp.—made the top 10 in profitability. Insatiable demand for its 386/486 family of microprocessors kept Intel's profits strong, and that strength continued into the first half of this year, despite the March 1991 availability of 386 chip clones from Advanced Micro Devices Inc. The 386 demand may be great enough to boost profits at both companies: Sunnyvale, Calif.-based AMD, which lost $53.6 million on revenue of $1.1 billion last year, expects to sell about $100 million worth of its 386 clones this year.

Cypress Semiconductor kept profits high by introducing 39 new products in 1990. More than a third of the company's revenue comes from static random access memory products, and late last year Cypress paid $14.5 million for Control Data Corp.'s $60 million fab in Bloomington, Minn. Cypress expects to make the plant the lowest-cost, most competitive SRAM fab in the United States.

Profits are hard to come by in the medical electronics sector as well, with efforts to control health-care costs putting a squeeze on some companies. Yet Acuson Corp. and pacemaker manufacturer Medtronic Inc. both made the top 10 profitability cut. A manufacturer of ultrasound equipment, Mountain View, Calif.-based Acuson gains from the cost/benefit of that technology compared with other scanning devices such as X-ray and computer-aided tomography (CAT) scan machines, says William Varley, vice president of marketing. The company held profits steady at near 17% for three years and expects to maintain that level.

Also making the top 10 was Cray Research Inc. of Eagan, Minn. A regular among the ELECTRONIC BUSINESS 200's most profitable companies, Cray continued to dominate the supercomputer niche in 1990 while branching out into the minisupercomputer marketplace. □

The most and least profitable

The top ten	Profits/sales	200 rank
Microsoft	24.1%	47
Autodesk	23.9	171
Novell	20.8	88
Acuson	16.9	138
Intel	16.6	18
Cadence Design Systems	16.4	176
Cypress Semiconductor	14.8	180
Cray Research	14.0	71
Medtronic	12.7	70
Compaq Computer	12.6	20
Median for the 200	3.8%	
The bottom five		
Wang Laboratories	-24.6%	37
Datapoint	-23.6	148
MAI Systems	-20.9	116
Ultimate	-20.2	197
Concurrent Computer	-20.2	134

Includes only companies with electronics sales over 50% of total

Calendar year Source: ELECTRONIC BUSINESS

The most improved in profitability

The top ten	Point change	Profits/sales 1990	Profits/sales 1989	200 rank
Control Data	23.4	0.2%	-23.2%	44
Sprague Technologies	23.3	0.7	-22.6	126
Micropolis	18.3	2.1	-16.2	117
Dialogic	17.2	6.1	-11.1	149
M/A-Com	15.2	4.2	-11.0	115
Exvin	12.9	0.1	-12.8	130
Kollmorgen	10.0	1.7	-8.3	186
Conicom	9.8	0.4	-9.4	156
Applied Magnetics	8.9	2.3	-6.6	112
Novell	8.5	20.8	12.3	88

Includes only companies with electronics sales over 50% of total

Calendar year Source: ELECTRONIC BUSINESS

Doing more with less isn't just a slogan anymore

After slumping in 1989, productivity among the top 200 grew 12% last year

By Elizabeth B. Baatz

The U.S. electronics industry has managed its resources more efficiently during the latest economic downturn than ever before. Last year, well over one-quarter of the ELECTRONIC BUSINESS 200 companies reduced their employee ranks while increasing sales at the same time.

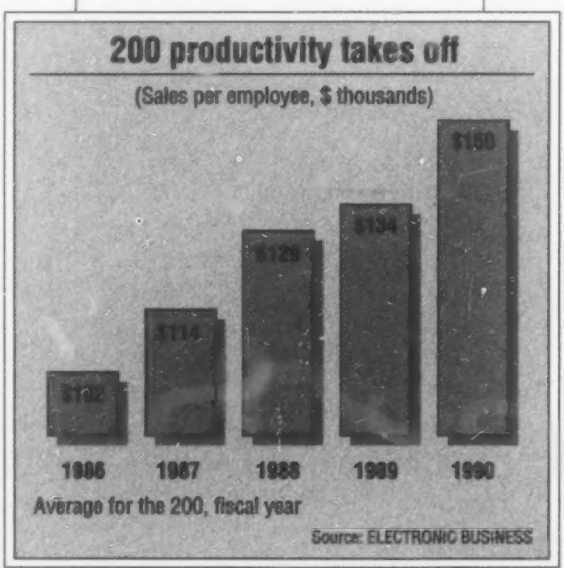
Total employment within the 200 companies fell by 2.4%, but total sales rose by 6.3%. As a result, productivity for the ELECTRONIC BUSINESS 200 (as measured by sales per employee) jumped 12% between fiscal 1989 and 1990, to reach an average of $150,010.

The prior year, productivity had inched up just 4%—actually a decline when inflation is factored in. With signs of a recession in the wind, electronics companies in the United States worried whether they could compete if productivity was on the downswing. The question was particularly troublesome because the 1986 recession had slashed productivity by 7.6%, despite a 13.9% cutback in ELECTRONIC BUSINESS 200 employment. As a result, the bottom line took it on the chin. Many observers last year feared that the productivity decline in 1990 would be as bad as in 1986.

But this time around, the productivity slump simply did not last, as sales per employee for the 200 rose a satisfying 12%. If the industry can maintain that kind of stellar performance this year and next, perhaps total quality management and the years of mergers and restructuring will finally pay off.

Indeed, the investment in productivity improvements has helped Dallas-based BancTec Inc., #200 on this year's ELECTRONIC BUSINESS 200 list. BancTec managed to reduce head count by 163 employees (8% of its work force) in fiscal 1990, while at the same time growing sales 4%. Sales per employee rose from $63,300 in 1989 to $104,000 in 1990, making BancTec the most improved company in terms of productivity on this year's list.

How did BancTec do it? According to chief financial officer G. Wesley Mayland, the company's judicious acquisition of Computer Entry Systems Corp. in January 1989 helped the numbers a great deal. "CES was three-quarters as large as BancTec," says Mayland, "so our revenue jumped. At the same time, we wiped out their overhead, got rid of a level of management, and saved money by removing duplicate field-service positions."



BUT A GOOD MERGER wasn't all that helped BancTec improve its numbers. BancTec has spent about $3 million in the past few years to improve its own technology, according to Mayland. As a company that sells labor-saving document readers to banks and financial institutions, BancTec knows the value of investing in productivity-enhancing technology. Electronic messaging, telemarketing tools, and other office equipment now help BancTec do more with less.

Disk-drive maker Quantum Corp. also makes the top ranks of productivity. The Milpitas, Calif., company (#77 on the list) sold $584,900 worth of products for every employee on its payroll last year. Only two other electronics companies in the 200 were more productive—consumer-electronics marketer Emerson Radio Corp.—with sales per employee of $800,200—and distributor Anthem Electronics Inc.—with sales per

employee of $701,300.

One reason that Quantum produces such high sales per employee is its manufacturing relationship with Japan's Matsushita Kotobuki Electronics, which makes about 90% of Quantum's products. The best way to join the ranking of most productive companies is to contract out all the labor-intensive work such as manufacturing—hence the addition of fabless semiconductor maker Chips and Technologies and four distributors to the top 10 most productive list.

What makes Quantum so special is not just that it ranks high in the *level* of productivity, but that the company also *improved* productivity by 49% last year. That placed Quantum in the #5 position on the list of most improved companies in terms of productivity. Quantum also was the only company among the top 10 most-improved companies that managed to raise productivity while increasing employment. The company's payroll rose 44% in fiscal 1990 while sales rose a whopping 266%. Back in 1987, Quantum's sales per employees stood at just $176,000.

Perhaps total quality management and the years of mergers and restructuring will finally pay off

According to Quantum's executive vice president of finance, Joe Rodgers, the manufacturing relationship with Matsushita Kotobuki has yielded dividends in productivity back at Quantum's own manufacturing plant in the United States. "We learned a lot from MKE—how to design product for automation and how to build it using robots," Rodgers says. "As a result, we've reduced scrap and other errors due to human handling, we have improved first-time-through yields, and, of course, we have reduced direct labor costs."

Clearly a merger that allows one to cut duplicate overhead while increasing sales and investment in labor-saving equipment can improve a company's productivity. But Anthem president Peyton Gannaway tells a simple story. When asked why his company, with sales per employee of $701,300, yields over $275,000 more than the next most productive electronics distributor, Gannaway says simply, "We just work harder."

The most and least productive

The top ten	Sales/ employee	200 rank
Emerson Radio	$809,200	76
Anthem Electronics	701,300	111
Quantum	584,900	77
Audiovox	446,600	141
Chips and Technologies	441,200	147
Arrow Electronics	425,900	65
Apple Computer	382,600	13
Pioneer-Standard	371,100	121
Tandon	365,200	107
Marshall Industries	341,900	85
Median for the 200	$124,000	
The bottom five		
Applied Magnetics	$31,500	112
CTS	45,300	158
National Semiconductor	51,200	43
Zenith Electronics	52,200	48
Vishay Intertechnology	53,690	100

Includes only companies with electronics sales over 50% of total

Fiscal year Source: ELECTRONIC BUSINESS

The most improved in productivity

The top ten	% change	Sales/ employee	200 rank
BancTec	64.2%	$104,000	200
Esterline	63.7	100,600	170
Recognition Equipment	53.5	152,200	189
Anacomp	50.8	130,400	183
Quantum	49.3	584,900	77
Harris	44.9	91,400	25
Concurrent Computer	44.6	123,700	134
Kollmorgen	42.4	95,400	186
M/A-Com	34.9	78,700	115
Micropolis	31.1	126,000	117

% change in 1990 from prior year

Fiscal year Source: ELECTRONIC BUSINESS

Working harder. Working smarter. Doing more with less. Every man and woman in corporate America has heard these slogans. But Anthem seems to have incorporated these slogans into its very culture. Says Gannaway, "We try to create the most productive people through extensive training and hiring. Our intensive quality program produces people that are more able and better motivated." At Anthem, the push for productivity comes from the top as management focuses on the most productive activities. "We have a strong application of the 80/20 rule," says Gannaway. "We identify those 20% of the activities that produce 80% of the results and avoid those activities that don't produce results."

That theory sounds good, but the challenge is in the execution. For the electronics companies that are still struggling to improve productivity and compete in the worldwide marketplace, that challenge has never been more critical than today. □

High tech chips away at its high debt

But analysts still warn that any debt in the volatile electronics industry may be too much

By Rick Whiting

After growing rapidly through 1988 and 1989, average corporate debt among U.S. electronics companies showed signs of leveling off in 1990. But while Compaq Computer Corp. in Houston and others paid off large blocks of debt last year, many continued to wrestle with the huge burdens they had accumulated in earlier years.

Within the ELECTRONIC BUSINESS 200, the weighted average debt as a percentage of total capital increased to 53.2% in 1990, up from 49.1% a year earlier. That continues a disturbing trend that began in 1988 when debt burden skyrocketed to 45.3%. Between 1983 and 1987, debt as a percentage of capital had averaged 26.9% for the top 200. These statistics include auto makers and companies with financial service and credit operations, which skews the debt picture.

On the other hand, among the companies in the top 200 where electronics products account for 50% or more of sales, things are much brighter; the ratio of average debt to total capital stood at 31.1% last year, down a fraction from 31.7% in 1989.

"That's certainly manageable," says Katherine Kirk, managing director of Hambrecht & Quist in Boston. She puts the red line for debt ratios at around 40%.

The median debt-to-capital ratio is showing signs of turning around among those ELECTRONIC BUSINESS 200 companies. This ratio fell to 22.9% in 1990 from 24.7% in 1988 and 1989, and 20% in 1987.

Given the industry's cyclical boom-or-bust nature, electronics is a tough business for companies that carry heavy debt loads. While sales of potato chips or cereals may change little through good times or bad, sales of computers and other electronics goods are more closely tied to swings in the economy, making debt financing a risky proposition.

"This is a fast-changing industry," notes Dick Frucci, a senior vice president with the Boston-based Putnam Management Co. His argument: Companies that are taking technological risks should not be taking financial risks. "The less debt on the balance sheet, the better."

Heavy debt burdens could also be dangerous for companies that sell into highly competitive markets—PCs, for example—where profit margins are razor thin. High debt payments are a fixed cost that vendors in such markets would rather do without.

CONSUMER ELECTRONICS manufacturers, whose average debt ratio spiraled upward from 25.9% in 1989 to 38.4% last year, recorded the greatest debt increase among all industry segments in 1990. Tandy Corp. in Fort Worth increased its ratio from 15.7% in 1989 to 35.5% last year by borrowing heavily to finance inventory increases, to buy back its own stock, and to acquire Victor Microcomputer of Sweden. North Bergen, N.J.-based Emerson Radio Corp.'s short-term borrowings to build up inventory pushed its ratio up from 57.6% in 1989 to 69.7% in 1990.

Meanwhile, makers of desktop computer systems cut their average debt ratio nearly in half, from 22% in 1989 to 11.6% in 1990. Prudential-Bache Securities analyst Rick Martin attributes the drop to several PC companies (including Compaq and AST Research) converting large chunks of debt into stock during the year.

Most industry segments showed little change from 1989 to 1990. Among communications equipment vendors, debt inched up from 28.8% of total capital to 29.3%; for distributors it

The biggest debt decreasers

The top five	Point change	Debt to capital 1990	Debt to capital 1989	200 rank
Litton Industries	-38.4	16.0%	56.4%	24
Conner Peripherals	-32.9	6.3	39.2	51
AST Research	-28.9	14.0	42.9	82
Storage Technology	-24.6	28.8	53.4	58
Silicon Graphics	-22.7	13.7	36.4	96

Fiscal year. Source: ELECTRONIC BUSINESS

The biggest debt increasers

The top five	Point change	Debt to capital 1990	Debt to capital 1989	200 rank
Smith Corona	47.0	51.3%	4.3%	123
Archive	46.2	58.4	12.2	122
Zenith	19.8	35.5	15.7	16
MAI Systems	19.3	83.8	64.5	116
Arrow Electronics	15.1	58.4	43.3	65

Fiscal year. Source: ELECTRONIC BUSINESS

decreased from 27.2% to 25.9%; and semiconductor manufacturers' debt held steady at 23.7%.

Mergers and acquisitions, a major culprit behind the debt increases of recent years, slowed in 1990. But the hangover persists. Despite efforts by executives to reduce debt load, Unisys Corp. in Blue Bell, Pa., was still burdened by a 51.7% debt ratio last year, the legacy of its creation through the merger of Sperry and Burroughs in 1986. Encore Computer Corp. in Fort Lauderdale, Fla., had one of the highest debt ratios in the ELECTRONIC BUSINESS 200 as a result of its borrowings for the April 1989 acquisition of Gould Inc.'s computer systems division.

Nevertheless, Frucci believes that the overall trend is toward a lowering of debt ratios among electronics companies, that increased competition is forcing executives to manage their businesses more efficiently, and that the same motivations for instituting just-in-time manufacturing and other competitive strategies are leading to more conservative financing practices. □

Cherry.
The switch company.

THE BIGGEST RISE

THE ELECTRONIC BUSINESS 200

Archive buys its way to revenue growth

The challenge now is to fight off tape-drive competitors while shedding debt from last year's buyout of Cipher Data Products

By David Webb

In the winter of 1989-90, two major U.S. data tape drive manufacturers, longtime rivals in the hotly competitive data backup market, squared off in a bitter takeover battle. It was the final face-off in what one industry analyst described at the time as "a bloody war."

Costa Mesa, Calif.-based Archive Corp., then a $181 million company flush with cash and the momentum of marketplace success, emerged as the victor in April 1990. Its embattled archrival, Cipher Data Products Inc. of San Diego, eventually succumbed to Archive's $130 million buyout siege.

The takeover nearly doubled Archive's size, turning it into a $293 million company and the world's largest independent vendor of data tape drives. The acquisition also helped Archive rise farther in the ELECTRONIC BUSINESS 200 than any other company on this year's list—64 slots, from #186 to #122. Cipher gave Archive not only new product lines and increased manufacturing capability, but also new customers—most notably IBM (a $120 million customer at the time) and Compaq Computer Corp. (then worth $66 million in business).

Before the Cipher acquisition, Archive was essentially a quarter-inch cartridge (QIC) tape drive manufacturer that targeted the desktop and midrange systems markets for hard-disk storage backup with QIC and half-inch cartridge tape drives. Today, it sells a gamut of tape storage products through five business units—two Cipher acquisitions and an earlier acquisition—allowing Archive to market nearly every type of mass-market tape drive.

The acquisition not only eliminated a competitor from the combined $2 billion worldwide markets for digital audio tape (DAT), QIC, and half-inch cartridge drives, but also gave Archive new ready-made distribution and OEM marketing channels. Through Cipher, Archive picked up Irwin Magnetic Systems Inc. and its very profitable quarter-inch minicartridge drive business. Irwin dominated the low-end PC backup storage market over Archive's own minicartridge line. Archive also acquired leading-edge half-inch tape cartridge drive technology in the form of a hot new desktop 3480 cartridge drive that Cipher developed to rescue itself from a proprietary-format whirlpool of doom.

Now Archive is ready to steamroll over the rest of the pack, according to chairman, CEO, and president Howard Lewis. The company's Ardat unit is eating up market share in the fast-growing worldwide market for DAT drives, nudging out Hewlett-Packard for the lead. Analysts expect Archive to stay in the lead a while, though Wangtek Inc. and Wangdat Inc. wield formidable strength in new products. But while HP has lost some ground in the DAT market, it is still a force to be reckoned with—not to mention members of a long list of Japanese and Asian vendors. Topping that list is Sony, followed by Toshiba America, Hitachi, and Sharp.

Founded in 1980 and publicly held since 1985, Archive produces a

Archive at a glance

Fiscal year ended Sept. 28	1990	1989
Sales (thousands)	$293,234	$181,409
Net income (thousands)	$11,537	$15,320
Net income/sales	3.9%	8.4%
Cost of sales/sales	59.2%	62.3%
R&D/sales	7.6%	6.8%
Marketing, G&A/sales	20.0%	16.2%
Number of employees	3,367	1,735
Sales per employee	$87,091	$104,559
Net income per employee	$3,426	$8,830
Capital expenditures/sales	7.2%	7.0%
Current ratio	2.15	2.40
Debt/equity ratio	1.40	0.13
Foreign sales/sales	27.7%	28.0%
Six months ended Mar. 29	**1991**	**1990**
Sales (thousands)	$179,506	$99,087
Net income (thousands)	$1,898	$7,508

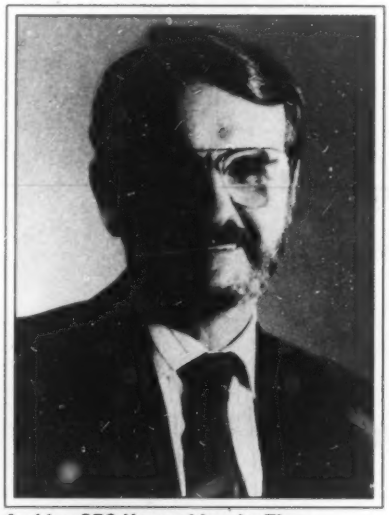
Source: Company reports

broad line of tape drives, tape subsystems, and backup software for computer data backup storage applications. The Cipher buyout (and the acquisition of Maynard Electronics Inc., a Casselberry, Fla.-based maker of storage subsystems, for $20 million in early 1989) was driven by Archive's need to fend off increasingly well-heeled offshore competitors in high-capacity tape storage.

COMPETITION AT HOME was heating up too. Rexon Inc. purchased two companies that bolstered their position in both OEM and distribution channel markets for tape drives. Rexon acquired QIC tape drive maker Wangtek and Tecmar, a subsystem manufacturer that competed with Maynard. The buyout enhanced Wangtek's channel presence and provided additional financial resources. Meanwhile, Cipher was building strength through its acquisition of Irwin, and even IBM was rumored to be testing the waters for high-end desktop storage with an undeveloped DAT drive.

But Archive has paid dearly for Cipher. Wall Street has looked disapprovingly on the company's stock since last fall, at least in part because the acquisition included the assumption of Cipher's own burden of debt. Optimem Inc., a wholly-owned WORM (write-once, read-many) optical disc drive subsidiary, was bleeding Cipher of cash with no hope of delivering a competitive product. (Archive wrote down and jettisoned the unit this year but retained service for Optimem's customers.) Cipher was also spending millions to battle competitors—mostly Archive—in court over patent disputes, none of which were fully resolved before Archive's hostile takeover.

"We acquired a company with some significant problems," says Archive CFO B. J. Rone, "and we never tried to paint a picture of [the buyout] as a one-year turnaround. The real advantages of the acquisition is a two- to three-year event."



Archive CEO Howard Lewis: The company must do "an exceptional job" of securing its data-backup business

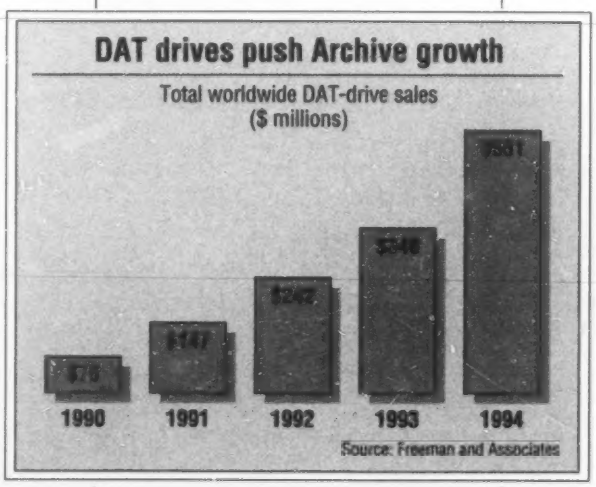
CEO Lewis also concedes the acquisition hasn't been easy. "In some respects, it's been smooth and [in others] difficult," he says. "We took care of all the real bad news at once, and that resulted from a lot of front-end planning. Within the first couple of weeks we had structured the [combined] company the way we wanted to." Nevertheless, he adds, integrating the new business into Archive's standard operations has been difficult.

Meanwhile, business for low-end 80- to 120-Mbyte QIC drives is falling off sooner than expected because of the recession and slower PC sales. QIC drive sales are still the company's largest revenue contributor, according to Lewis, but DAT is expected to eventually wipe out demand for QIC drives because of falling prices. Volume pricing for 1.3-Gbyte DAT drives have dropped below $1,000, making the devices more attractive to users on a cost-per-megabyte basis.

But the market for QIC drives is far from dead. Archive and Wangtek each have shovelled out 1.3-Gbyte DC-600 class QIC drives, and 500-Mbyte DC-2000 minicartridges are now in the market. "There is still room at the low end for quarter-inch, especially in the minicartridge [market]," says Bob Abraham, vice president of the Santa Barbara, Calif., market research firm Freeman Associates.

Moreover, Archive is using DAT drives as building blocks for cheap, very high capacity multiple-gigabyte automated DAT cartridge libraries (commonly known as "stackers") for network and large system storage backup. "I believe that growth in business in backup will be near 25%," Lewis says. "We're going to have to do an exceptional job in taking advantage of high-capacity demands."

The challenge in the meantime is to accomplish that while bringing down the debt burden acquired from Cipher. Rone says the company will pay off a $120 million loan before the four-year payback period is up; nearly half of a $40 million revolving loan has been paid. The company has ramped up production of its latest-generation 3.5-inch form factor DAT drives and is readying production of a 1.3-Gbyte QIC drive for the fall. Both products are seen as essential to sustaining Archive's momentum. □



THE BIGGEST FALL

Recognition Equipment rebuilds itself—and its reputation

The company dropped 30 places on this year's ELECTRONIC BUSINESS 200, but it is now drawing kudos for a brand-new strategy

By Peter Burrows

There's nothing good about a federal fraud investigation that leads to the resignation of your CEO, class action suits, a temporary ban on doing business with the government, at least $450,000 in legal fees, and an unsavory reputation with existing and would-be customers. Or is there?

Thomas M. Hurley, co-CEO of Dallas-based Recognition Equipment Inc., would know. He claims that federal bid-rigging allegations against his predecessor and the company itself cost REI more than $100 million in lost business, legal fees, and settlements since the indictments came down in October 1988. But he also says that the company would not have been able to make the sweeping changes of the past year if the pressure had not forced out the company's former management team (both of whom were acquitted last November).

"We tried to look at it as an opportunity," says Hurley, who took the reins with partner Robert Vanourek in October 1989. The pair, with the backing of The Prospect Group, a New York investment firm, previously made two unsuccessful hostile bids for the company after the indictments were brought; intense trial-related pressures and shareholder lawsuits finally compelled the board to submit. "The investigation created a power vacuum, and we came in to fill it," says Hurley.

Since then, Hurley and Vanourek have moved quickly to remake the 29-year-old company in their own image. Their decision to reposition and downsize REI has produced some hefty write-offs and huge headaches for the short term, including a $31 million loss in 1990 and a fall from #159 on the ELECTRONIC BUSINESS 200 to #189—the biggest drop of any company in this year's ranking. But the new management team says the pain was inevitable. For although REI had earned a reputation for technical innovation for its proprietary, stand-alone document-handling and data/image-recognition equipment, big losses in 1988 and 1989 indicated the old strategies were not working. Indeed, the company took annual losses four times during the 1980s, for a net loss of $26 million for the decade.

WITHIN WEEKS OF taking charge, Hurley and Vanourek decided to refocus the company entirely on the document image-processing business. This emerging industry—which is expected to grow from $890 million in 1990 to $5.7 billion in 1994, according to New York-based Frost & Sullivan—is being driven by large computer companies and system integrators, who combine hardware such as scanners and optical readers with software for customers in search of an automated means of data entry and paper processing. Rather than sell directly to end users, the new strategy is designed to ride the shoulders of these large system vendors by having them sell REI equipment as part of their integrated offerings.

Much of the required restructuring was done in 1990. All of the former managers—except the

Recognition Equipment at a glance

Fiscal year ended Oct. 31	1990	1989
Sales (thousands)	$230,618	$255,874
Net income (thousands)	-$31,687	-$38,803
Net income/sales	-13.7%	-15.2%
Cost of sales/sales	64.6%	63.8%
R&D/sales	4.3%	2.5%
Marketing, G&A/sales	29.1%	31.7%
Number of employees	1,515	2,540
Sales per employee	$152,223	$100,738
Net income per employee	-$20,916	-$15,277
Capital expenditures/sales	1.4%	1.9%
Current ratio	2.04	1.63
Debt/equity ratio	2.13	1.15
Foreign sales/sales	57.9%	57.7%
Six months ended Apr. 30	1991	1990
Sales (thousands)	$74,473	$116,323
Net income (thousands)	$3,673	-$12,989

Source: Company reports

general counsel—were replaced. Three business units that were deemed outside the document-imaging rubric, as well as five foreign subsidiaries that had been used primarily as direct-sales offices, were sold. The remaining head count was reduced by 25%. The result was a 30% reduction in assets (from $240 million to $170 million) and a 40% cut in head count (from 2,540 employees to 1,515).

The company also has moved to build on the former management's 1989 purchase of Plexus Computer Inc., a bankrupt software company whose application development tools are regarded as a standard in the document-imaging world. Since many system vendors use Plexus software to develop their own document-image processing applications, analysts say the purchase was a savvy way to carve a door into this rapidly developing marketplace. The move already has helped REI reach various partnering agreements with system vendors such as Amdahl, Andersen Consulting, AT&T, Data General, Hewlett-Packard, NCR, Sun Microsystems, TRW, Unisys, and Wang Laboratories.

Co-CEOs Tom Hurley (left) and Bob Vanourek have wasted little time refocusing the company after federal fraud indictments chased REI's former management in 1989

THE PLEXUS acquisition has another key advantage. Because the software is hardware-independent and features extensive networking, the integration of REI's formerly proprietary equipment with Plexus software has provided a more open architecture, allowing the equipment to work with many popular commercial hardware platforms. Hurley admits the company has far to go to change its hardware-based corporate culture, but all indications are that REI is trying to fall into step with the trend toward open systems.

Hurley says the company's recovery is on track. The goal for 1991, he says, is a return to profitability, and the company has managed to make a meager profit of $3.7 million through the first half of their fiscal year. He also points to the 54% gain in productivity per employee between 1989 and 1990—the second best on this year's EB 200—and says the company has eliminated four management levels from its traditional eight-tier structure. "We've bitten the bullet," says chairman Gilbert H. Lamphere, whose full-time job is chairman of The Prospect Group, which recently sold its 20% stake in the company. "This is the year to look for profits."

But many observers are growing impatient. The profits of the first two quarters have been due more to asset sales than to operating income, productivity gains are largely a result of the slashed head count, and few of the new-look products have actually come to market. "Stating a corporate objective is fine, but it's easier said than done," according to Jane Stanhope, an analyst with BIS Strategic Decisions in Norwell, Mass.

And the company has not quite shed the unsavory reputation that comes with being tied up in federal fraud investigations, which, in this case, focused on a complex bid-rigging scheme to land a $400 million contract with the U.S. Postal Service. Launched in 1985, the investigation resulted in the conviction of two public relations consultants and a former vice chairman of the Postal Board of Governors, who handed out bribes and kickbacks in an attempt to land the contract. REI and the two indicted former executives were ultimately acquitted as unwitting victims of this scheme.

But REI's reputation has suffered despite the acquittals. "Most citizens do not think the government goes around indicting innocent people," says Hurley. "So we have to prove to them that we are still the company they once knew and loved. You just can't escape your reputation." □

Up-and-comers for 1991

Some companies that just missed this year's ELECTRONIC BUSINESS 200 will be strong contenders the next time around

By Barbara Jorgensen

It's nearly impossible to list the top 200 U.S. electronics companies without wondering about the ones that *almost* made it.

We counted 21 such companies this year. With revenue between $162 million and $187 million, their exclusion in no way suggests poor performance. In fact, only 3—Digital Communications Associates, GenRad Inc., and Dynascan Corp.—saw sales decline from calendar 1989. But controller manufacturer MagneTek Inc. increased electronics revenue 55.5% and business equipment maker EMC Corp. enjoyed a 29.4% rise, while sales for The Cherry Corp. and Rexon Inc. climbed over 20%.

So why didn't those companies make the cut this year? The reason is that the price of admission has gone up. While the collective weight of all the 200 grew by 6%, the cut-off point for the #200 company grew 17% from calendar 1989 to 1990. If this trend continues, the #200 company will need at least $220 million in electronics sales to make the list next year.

This year's near-miss (#201) is PC communications company Digital Communications Associates, which ranked #174 on last year's 200 list. DCA, explains president Garry Betty, began a painful reexamination of its business with the sale of its wide-area network division (its premier business) in December 1989.

"We invested heavily in our [WAN] business at the expense of our PC-communications products," says Betty. Meeting customer needs, he says, was something DCA had forgotten as it turned inward and examined its own needs. But through a variety of new product introductions, product upgrades, and forums for interacting with customers, projections for fiscal '91 look good. As for the #201 spot, Betty jokes: "We should have sold another $3 million in equipment." But, he warns, don't discount DCA for next year.

Another strong candidate for next year's 200 is Exabyte Corp., whose 1990 revenue of $170 million was nearly double the $89 million in 1989. "I'd be surprised if we didn't make next year's list," says CEO Peter Behrendt. Exabyte has adapted a consumer technology for its now-booming 8mm cartridge tape data-storage subsystem business and counts IBM, Sun Microsystems, Siemens, and Groupe Bull among its customers.

LTX Corp., which along with GenRad has been struggling through difficult years in the board- and chip-test businesses, made a comeback of sorts. Sales in calendar 1990 rose 47% over the previous year. The company last made the 200 in 1988. LTX's manager of investor relations, R. Scott Higgins, says, "1989 was a tough year for us. We hit bottom." The company's turnaround strategy consists of maximizing opportunities in digital logic test, improving its performance in the Far East, and capitalizing on its Synchromaster mixed-signal-chip test system. Financial indications so far look good, says Higgins, and Wall Street projects that LTX will end fiscal 1991 in July between $190 million and $200 million. Unfortunately for LTX, that most likely means they'll be missing from next year's ELECTRONIC BUSINESS 200 as well. □

The next 21 companies

Rank	Company	Electronics sales ($ millions)
201	Digital Communications	$187
202	MagneTek	185
203	Harnischfeger Industries	184
204	Legent	181
205	GenRad	179
206	Exide Electronics	178
207	Burr-Brown	177
208	SynOptics Communications	176
209	LTX	173
210	Cherry	173
211	EMC	171
212	Exabyte	170
213	Rexon	170
214	Telxon	169
215	Dynascan	169
216	Adobe Systems	169
217	Intermec	168
218	Brown & Sharpe	166
219	Network Systems	164
220	Richardson Electronics	163
221	MTS Systems	162

Calendar year 1990 Source: ELECTRONIC BUSINESS